Central Inverter

SUNNY CENTRAL 200 / 250 / 250HE / 350

Installation Guide

SC20_25_35-IEN094521 | 98-4004821 | Version 2.1

EN

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1 Notes on this Manual

1.1 Scope of Validity

This manual describes the transport, installation and commissioning of SMA central inverters of the following types:

- Sunny Central 200 (SC 200)
- Sunny Central 250 (SC 250) with the "Protection against chemically active substances" option
- Sunny Central 250 (SC 250)
- Sunny Central 250 (SC 250) with the "Protection against chemically active substances" option
- Sunny Central 250HE (SC 250HE) with the "High Efficiency" option
- Sunny Central 350 (SC 350)

1.2 Target Group

This manual is intended for installers and operators of photovoltaic systems equipped with Sunny Centrals.

1.3 Additional Information

Keep all manuals for the Sunny Central and for the installed components together with the system documentation. They must be accessible at all times.

You will find further information on the Sunny Central in the download area of www.SMA.de/en. Among other things, the download area contains the following items:

- Sunny Central Installation Requirements
- Sunny Central Certificates
- Additional information on other options (e.g. GFDI)

1.4 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE indicates a situation that can result in property damage, if not avoided.

Information

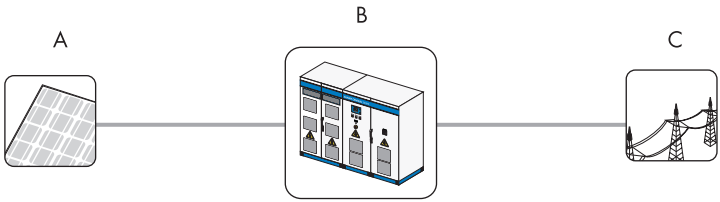
Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety

2.1 Appropriate Usage

Sunny Central is a central inverter. It feeds solar energy converted via photovoltaics from solar modules into a low- or medium-voltage grid.

Principle of a grid-connected solar power system with a Sunny Central



A Photovoltaic generator B Sunny Central C Low voltage or medium voltage grid

Sunny Central 200 / 250 / 350

Sunny Central 200 / 250 / 350 contains a low voltage transformer and feeds into low voltage grids.

Sunny Central 250HE

Sunny Central 250HE is a high-efficiency central inverter without its own low-voltage transformer. The Sunny Central 250HE feed into the medium-voltage grid via a shared medium-voltage transformer.

2.2 Safety Instructions

Faults that affect or limit the safety of the device must be rectified immediately. Unauthorized modifications and spare parts not recommended by SMA Solar Technology may cause fire, material damage and electrical shock. Unauthorized personnel must not have access to the devices.

Signs must always be attached in prominent positions. Damaged signs must be replaced immediately.

2.2.1 Personnel

Only qualified personnel may work on the Sunny Central. "Qualified" means that the personnel must have been trained for the activity performed.

The personnel must be familiar with the content of the installation guide and user manual in order to commission and / or operate the Sunny Central. In particular, the safety instructions must be followed.

2.2.2 Installation

Observe the installation conditions for the Sunny Central (separate document). The describe what you must bear in mind when installing the Sunny Central.

An electrical service room is ideal for installation of the Sunny Central, to achieve optimal noise and fire protection.

The Sunny Central was designed for use in industrial environments in terms of the EMC thresholds (EMC = Electromagnetic Compatibility).

Note the following points when installing the Sunny Central:

- The inlet and exhaust ventilation systems for the Sunny Central must be separate to any other ventilation, in order to minimize smoke distribution in case of fire.
- A sufficient escape route must be guaranteed.
- The EMC specifications must be observed (see technical data).

Smoke detector

We recommend that you install smoke detectors in the service room to deactivate the Sunny Central if smoke develops. Incorporate the smoke detector in the Emergency Stop circuit.

2.2.3 Special Hazards of Photovoltaic Systems

Photovoltaic systems in particular have some special hazards. They are described below:

- An active power source is connected. Depending on the operating mode, there may be voltage present from the photovoltaic generator and the Sunny Central. This is especially important to note when disconnecting particular parts of the system
- As a result of the very high DC voltages, arcing may occur if fuses and plugs are used incorrectly.
- The short circuit current of the photovoltaic generator is only slightly higher than the maximum operating current and also depends on irradiation conditions. If a short-circuit occurs in the system, the available fuses are not guaranteed to switch off.
- A highly complex generator array may be difficult to disconnect if a fault develops (e.g. short circuit). We recommend additional external DC circuit breakers, which disconnect the inverter, the main DC lines and the Sunny String-Monitors (DC switches are available as an option).

2.2.4 Working on the Sunny Central

Work may only be performed on the Sunny Central when it is disconnected. Observe the following safety rules when working on the Sunny Central:

1. Disconnect
2. Ensure that the device cannot be reconnected
3. Ensure that no voltage is present in the system
4. Ground and short-circuit if necessary

5. If necessary cover or protect against accidental contact with any voltage-carrying components.

The individual safety rules are listed in greater detail below:

Disconnection (in the event of team connection: both team members must be disconnected)

If the Sunny Central is running with team connection, disconnect both the team leader and the team device. The following list shows which sources of voltage must be be disconnected:

1. Grid voltage for grid feeding (AC main switch)
2. Grid voltage for the supply the system's power supply (if the system draws its power supply from external sources)
3. DC voltage from the photovoltaic generator
   - Unplug the DC fuses to disconnect the photovoltaic generator. The DC fuses of the two poles are behind the protective covers. Remove the protective covers to pull the DC fuses. Never remove both covers simultaneously. After removing the fuses on one pole, attach the covers again.
   - Pull the DC input fuses only when the load is off to prevent dangerous arcing. Use a clip-on ammeter to measure whether the DC input is off-load. The DC input fuses may only be removed with personal safety equipment and a fuse grip. There are three ways to disconnect the DC voltage from the photovoltaic generator:
     - Pull the internal DC input fuse
     - Pull the external DC input fuse (if a Sunny Main Box is used)
     - Via an external circuit breaker (if available)
4. DC voltage for team connection (if team connection is used)
5. Additional external voltage (e.g. emergency shut-off)

Even deactivated Sunny Central units may contain voltages which are dangerous to the touch. After deactivating the Sunny Central, wait at least 5 minutes until all capacitors are discharged before starting to work on the Sunny Central.

When the DC fuses are inserted in the Sunny Central (on both team members if team connection is used), there is a reverse voltage on the DC main and sub-distributors.

Disconnecting system parts without danger

We recommend additional DC circuit breakers for the Sunny Central, the main DC lines and Sunny String-Monitors. DC circuit breakers allow system parts to be disconnected without danger.

Ensure that the device cannot be reconnected

Ensure that the Sunny Central cannot be reactivated.

Ensure that no voltage is present in the system

Ensure that all internal and external sources of voltage are disconnected.

Ground and short-circuit the unit if necessary (not on the DC side)

Ground and short-circuit the AC side. The DC side does not have to be grounded.

If necessary, cover or shield any adjacent live components

Cover or shield all adjacent live parts to prevent accidental contact.

2.2.5 General Information

Overvoltage and lightning protection

The devices have internal overvoltage protection on the AC and DC sides. However, the desired protection level can only be achieved if a lightning protection area concept exists for the installation building as per DIN VDE 0185-4, i.e. lightning conductors or combined surge and lightning conductors (not included in delivery) are available at, among other locations, the building's entrance (transfer lightning protection area LPZ 1).

The combined overvoltage and lightning protection for the analog inputs can be ordered as an option.

Emergency Shut-off

In photovoltaic systems with more than one Sunny Central, or additional external emergency shut-off switches, the emergency-shut off circuits must be connected to one another. Only one Sunny Central may supply the emergency shut-off circuit with voltage. For further information on connecting external emergency shut-off switches, see section 6.10 "Connecting the Emergency Shut-off" (page 71).

Ear Protection

The device fans and the power unit create elevated levels of operating noise. In addition to this, a fault in the device can lead to very high sound levels. While in the service room, we recommend that you wear ear protection.

Burns

Immediately after disconnecting the Sunny Central, depending on the operating conditions, certain components can be very hot (e.g. fuses, transformer core, sine wave filter, heatsinks etc.).

When working on hot components, we recommend that you wear gloves.

Torque

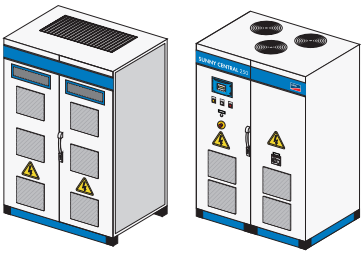
The circuit diagram contains a torque list. It provides details on all relevant torques. Observe these torques when tightening the individual threaded connections. You can also ask Sunny Central Service what the respective torques are.

Fuse Grip

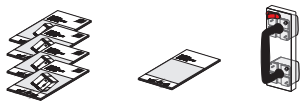
A fuse grip is supplied with the Sunny Central for removing and inserting the fuses when the power supply is disconnected. Additional safety equipment is required if fuses are not removed or inserted when the power supply is disconnected.

3 Scope of Delivery

3.1 Standard Scope of Delivery Sunny Central 200 / 250 / 250HE

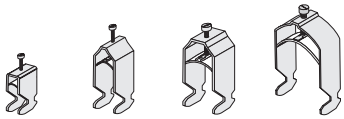


A B

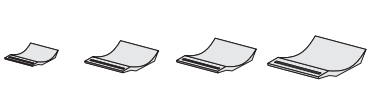


C D E

F G



H1 H2 H3 H4



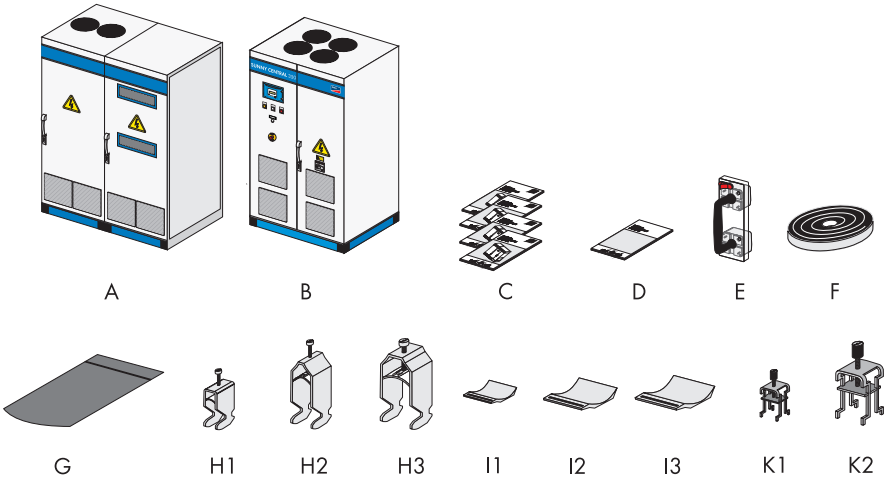
I1 I2 I3 I4

K

Position	Number	Name
A	1	DC- / inverter cabinet
B	1	AC cabinet
C	1	Document set • Installation guide • User manual • Variant circuit diagram • Commissioning report
D	1	Documentation of the optional insulation monitoring (Bender)
E	1	Fuse grip
F	2	Terminal profile 3 m

Position	Number	Name
G	1	Switch cabinet installation set • Vertical baying clamp • Baying bracket TS corner • Horizontal baying clamp • Baying quick connector
H1	18	OBO cable clamp 16 – 22 mm
H2	1	OBO cable clamp 58 – 64 mm
H3	8	OBO cable clamp 28 – 34 mm
H4	16	OBO cable clamp 22 – 28 mm
I1	18	OBO clamping saddle
I2	1	OBO clamping saddle
I3	8	OBO clamping saddle
I4	16	OBO clamping saddle
K	10	Shield clamp 0-8mm

3.2 Standard Scope of Delivery Sunny Central 350



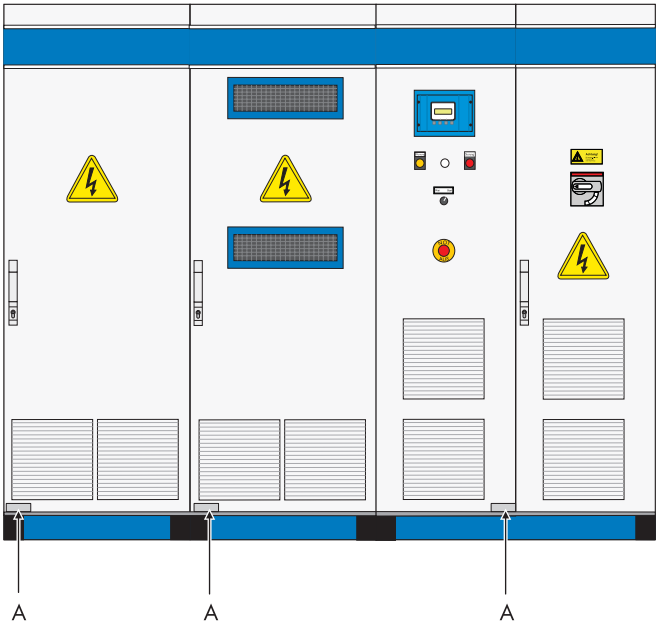
Position	Number	Name
A	1	DC- / inverter cabinet
B	1	AC cabinet
C	1	Document set • Installation guide • User manual • Variant circuit diagram • Commissioning report
D	1	Documentation of the optional insulation monitoring (Bender)
E	1	Fuse grip
F	2	Terminal profile 3 m
G	1	Switch cabinet installation set • Vertical baying clamp • Angle bracket TS corner • Horizontal baying clamp • Baying quick connector
H1	6	OBO cable clamp 16 – 22 mm
H2	12	OBO cable clamp 28 – 34 mm
H3	24	OBO cable clamp 22 – 28 mm
I1	6	OBO clamping saddle

Position	Number	Name
I2	12	OBO clamping saddle
I3	24	OBO clamping saddle
K1	5	Shield clamp 0-8mm
K2	4	Shield clamp 19 mm

3.3 Identifying the Sunny Central

You can identify the Sunny Central using the type label. The type label is located on the inside of the door of the Sunny Central.

The serial number (A) is printed on the type label and on the front side of the Sunny Central.



3.3.1 Check for transport damage

Check the device packaging and the Sunny Central for any possible damage and compare the scope of delivery with the delivery documentation. In the case of damage to the device or unclear delivery contents, immediately contact SMA Solar Technology.

3.3.2 Storage

The transport packaging provides sufficient protection against moisture and damage when transporting the Sunny Central.

Notice!

Penetrating moisture can damage the Sunny Central.

- The storage condition requirements are the same as the conditions for operating the Sunny Central.
- Storing the Sunny Mini Central in packaging.
- Avoid extended storage.
- If stored for an extended period, remove moisture and soiling.
- Before commissioning, contact Sunny Central Service if the storage period is longer than one year.

4 Installation

This section describes the transport options for the Sunny Central and the requirements of the installation site.

Different transport and installation conditions apply to each Sunny Central. They are available in the SMA Solar Technology download area.

Identifying cabinet units

The Sunny Central consists of 2 switch cabinets. If multiple Sunny Central units are delivered, only install switch cabinets with the same serial number together.

4.1 Installation site requirements

Floor

The floor must guarantee solid and safe positioning of the Sunny Central. The floor must provide the load-carrying capacity necessary to cope with the weight of the Sunny Central. Do not install the Sunny Central on a slope. Level any unevenness in the floor.

Wall Clearances

When installing the Sunny Central, comply with the corresponding wall clearances for minimum passages, escape routes and ventilation. The "Sunny Central Installation Requirements" (separate document) contain the respective minimum clearances.

Inverter Protection Rating / EMC / Sound Levels

The Sunny Central is suitable for installation in dry areas with low dust levels. The Sunny Central was designed for use in industrial environments in terms of the EMC thresholds (EMC = Electromagnetic Compatibility) and sound levels.

4.2 Electrical Service Room

When installing and connecting the Sunny Central central inverter, observe the requirements for electrical operating rooms, installing high-voltage current plants up to 1000 V, and the requirements for passage widths and escape routes.

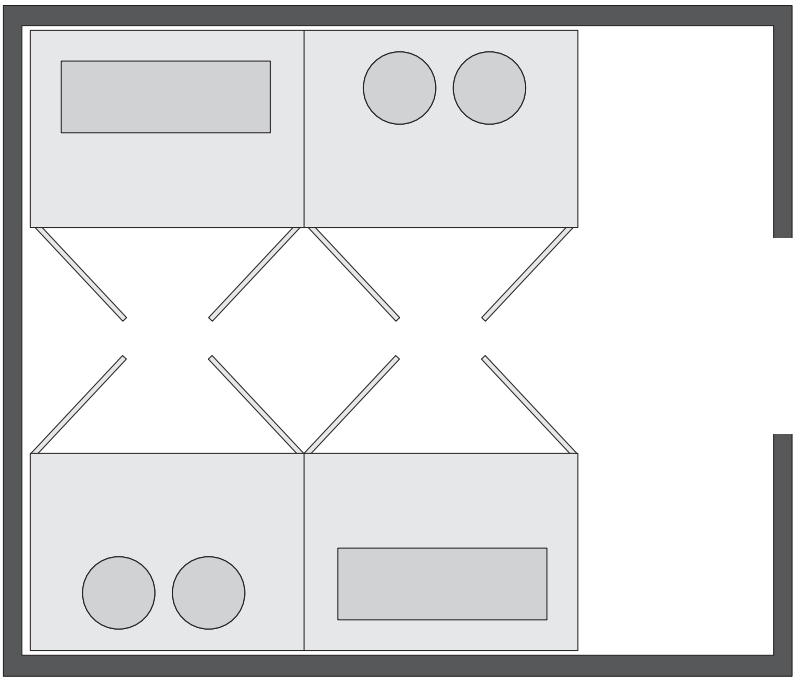
4.2.1 Minimum Passage Width

Note the following points for the escape routes in electrical service rooms:

- When the switch cabinet door is opened as far as possible, a minimum passage of 500 mm (escape route) must remain.
- In order to comply with the minimum passage width, if two switch cabinets are installed opposite one another (e.g. in a station building), only one of the switch cabinets may be opened.

4.2.2 Design

The following illustration is a schematic of the layout of an electrical service room with a Sunny Central 250HE.



4.3 Ventilation

An incoming air supply is required to cool the Sunny Central. In order to guarantee safe operation and the maximum of feed-in power, the permitted ambient temperature must be observed.

The required air is drawn through the switch cabinet doors and is blown out via the top or the rear wall of the cabinet unit depending on the Sunny Central model. This means that the devices can be installed right next to one another. See the "Sunny Central Installation Requirements" (separate document) for the air requirements as well as appropriate wall clearances. Filters are installed at the air inlet openings. They clean the inlet air.

If the volume of air at the installation site of the Sunny Central is insufficient, then on-site measures must be taken to provide greater quantities of air (ventilation grilles, blowers, fans, etc.).

The inlet air must satisfy the requirements of classification 3S2. If a Sunny Central is used in a chemically-active environment, the inlet air must satisfy the requirements of classification 3C1.

The central inverter can be operated in relative humidity from 15 ... 95 %.

The heat generated by the Sunny Central (exhaust air) must be dissipated to comply with the maximum permitted ambient temperature. We recommend routing the exhaust air (air duct) out of the electrical service room.

Overview of the Air Inlets and Outlets

The positions of the air outlets differ depending on the Sunny Central model selected. During installation, ensure that the air inlets and outlets are not covered.

Air Routing for the "EVR" Option

If the "EVR" option was selected, the exhaust air cannot be routed through the top of the Sunny Central.

NOTICE!

Overheating impairs the operation of the Sunny Central.

Ensure that the Sunny Central is sufficiently cooled:

- Provide the required air volume for the Sunny Central.
- Clean the ventilation openings (filter pads) and the exhaust air bars at regular intervals. See the Sunny Central maintenance manual for the exact cleaning intervals.
- Route the exhaust air separately from the individual cabinet units (air outlets of the power units and the switch cabinet) to prevent thermal short circuits.

If routing the exhaust air through the rear wall of the Sunny Central, the exhaust air can be routed directly out of the building via a weatherproof grille installed on-site in the building wall. The Sunny Central can then be set up with the rear of the cabinet directly against the opening in the building wall. Remove the finger guard from the fan openings and secure a seal or frame-like air hood to the building wall.

DANGER!

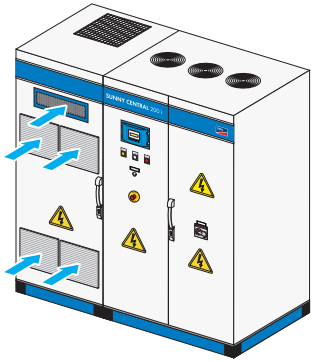
Loss of limbs!

If the exhaust air is routed directly out of the building, the rotor blades of the fan are not protected against contact.

- When cleaning the ventilation duct, switch off the Sunny Central.
- Do not start to clean the ventilation duct until the rotor blades of the fan have come to a stop.

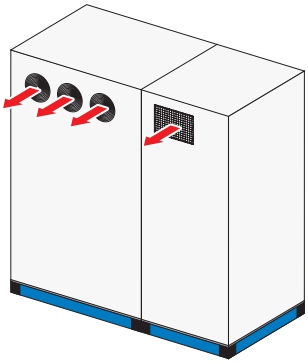
The following illustrations show examples of where the individual air inlets and outlets are located.

Sunny Central 200 air inlets

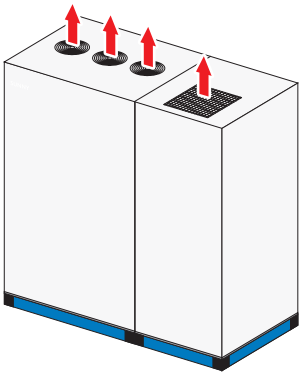


Sunny Central 200 air outlets

The position of the air outlets of the Sunny Central 200 depends on the variant. Depending on the variant, the air outlets are on the rear or in the top of the Sunny Central.

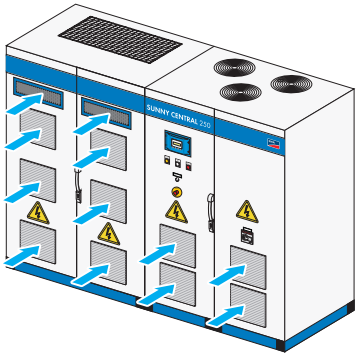


Air outlets on the rear



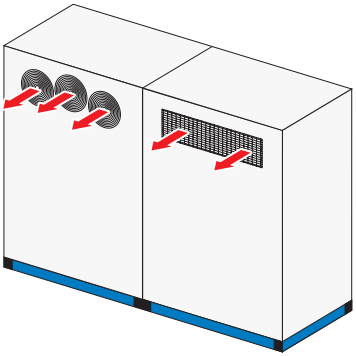
Air outlets in the top

Sunny Central 250 air inlets

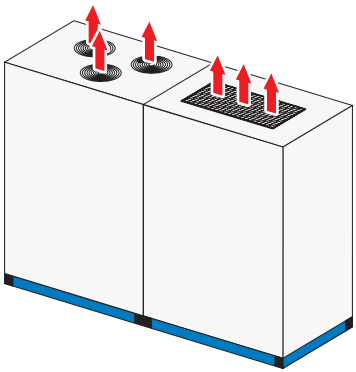


Sunny Central 250 air outlets

The position of the air outlets of the Sunny Central 250 depends on the variant. Depending on the variant, the air outlets are on the rear or in the top of the Sunny Central.

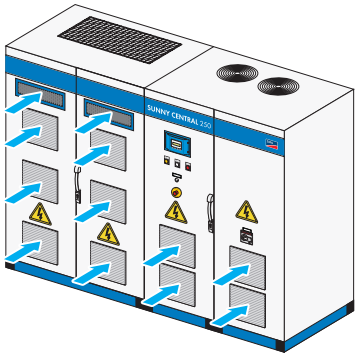


Air outlets on the rear



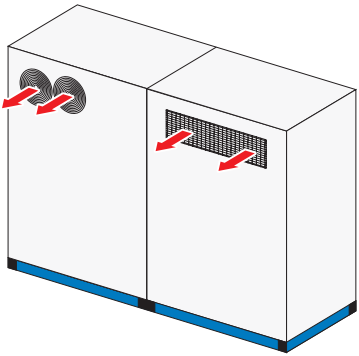
Air outlets in the top

Sunny Central 250HE air inlets

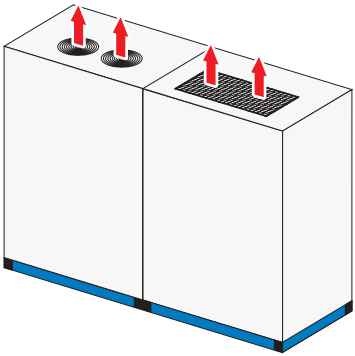


Sunny Central 250HE air outlets

The position of the air outlets of the Sunny Central 250HE depends on the variant. Depending on the variant, the air outlets are on the rear or in the top of the Sunny Central.

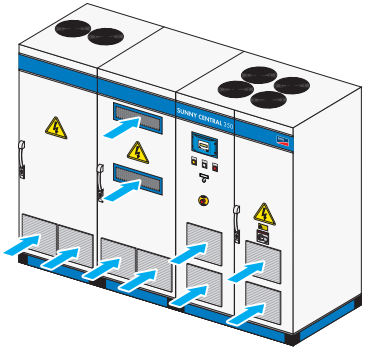


Air outlets on the rear

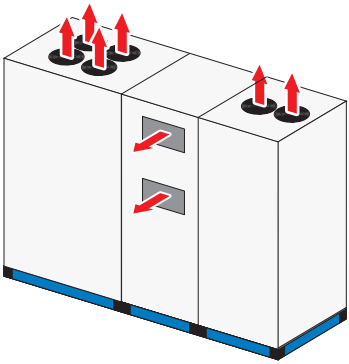


Air outlets in the top

Sunny Central 350 air inlets and outlets



Supply air



Exhaust air

4.4 Transport Options

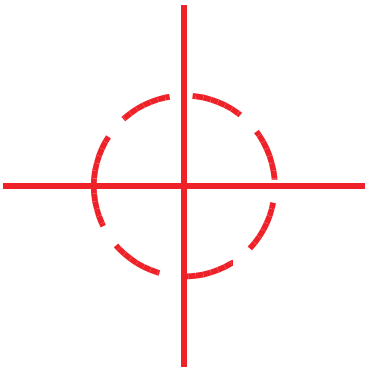
Sunny Centrals can be transported with a forklift, lifting cart or a crane fork. They consist of two switch cabinet units, the DC- / inverter cabinet and the AC cabinet.

WARNING!

Danger of crushing if the switch cabinet unit tips over!

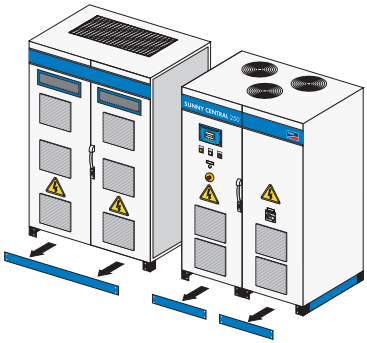
The Sunny Central can tip over during transport if the center of gravity is not in the middle.

- Only transport switch cabinet units upright.
- The center of gravity is indicated on the packaging and on the Sunny Central.



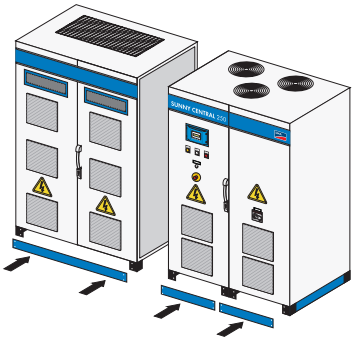
4.4.1 Transporting the Sunny Central using a Lifting Cart or Forklift

1. Use a TX30 torque wrench to remove the front and rear base covers.



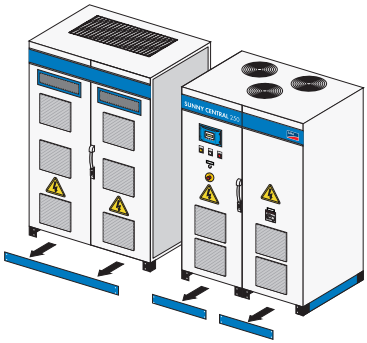
2. Pick up the switch cabinet unit with the lifting cart or forklift.
3. Transport the switch cabinet unit to the installation site.

4. Reattach the front and rear base covers.



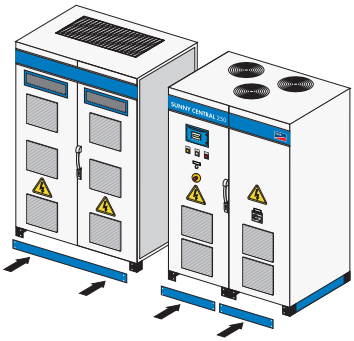
4.4.2 Transporting the Sunny Central using a Crane

1. Use a TX30 torque wrench to remove the front and rear base covers.



2. Pick up the switch cabinet unit with the crane fork.
3. Transport the switch cabinet unit to the installation site.

4. Reattach the front and rear base covers.



4.5 Assembly at the Installation Site

The Sunny Centrals have a high dead weight. Additional anchoring in the floor or in the wall is unnecessary.

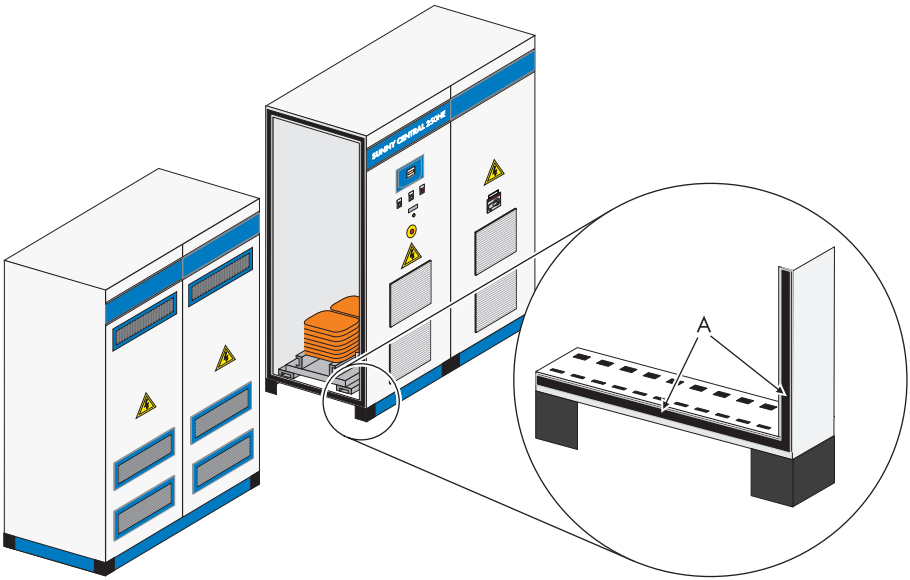
4.5.1 Connecting Switch Cabinets to one Another

Enclosed documentation of the switch cabinet manufacturer

Follow the instructions in the enclosed documentation of the switch cabinet manufacturer to connect the two switch cabinets to one another. The assembly procedure is described there.

If you are using a Sunny Central 200 / 250 with the "Protection against chemically active substances" option, the switch cabinets must be connected to one another as described below.

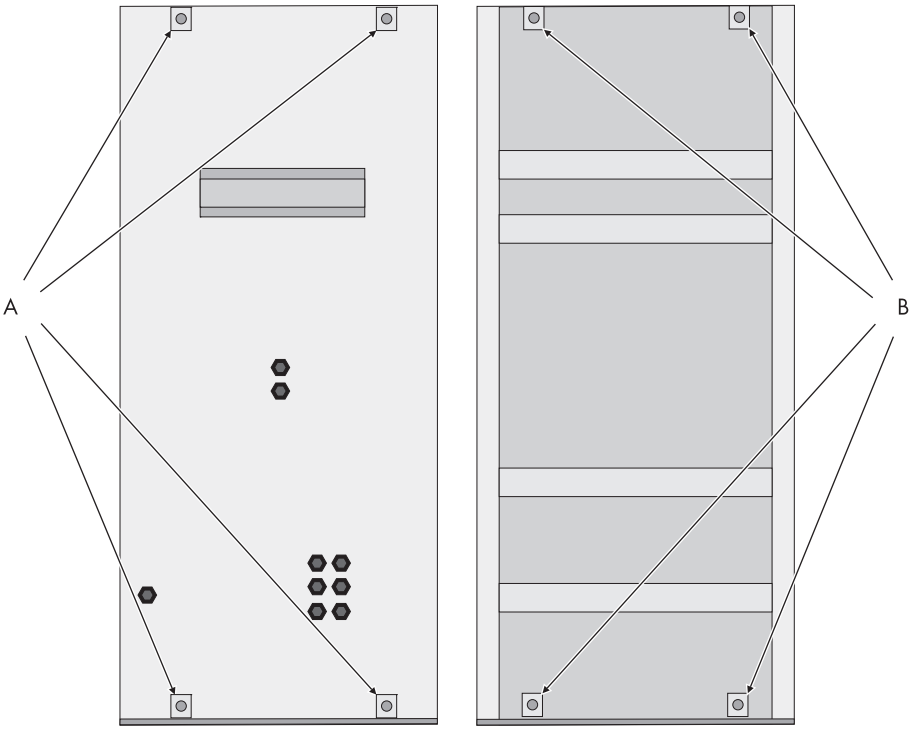
1. Attach the included sealing material all around the cabinet frame of the AC cabinet.



A Seal material

2. Install the switch units at the installation site.

3. Connect the switch cabinet units at positions A and B with the provided bolts, washers, locking washers and brackets. Follow the instructions in the enclosed Rittal documentation. The diagram below shows Sunny Central 250 with the "Protection against chemically active substances" option.



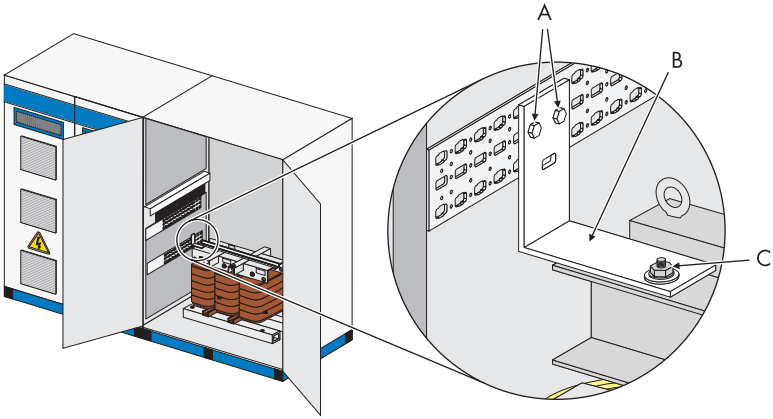
☑ The switch cabinet units are connected to each other.

4.5.2 Removing the Transport Locks

In some Sunny Centrals, the transformer is fitted with transport locks. They connect the transformer to the switch cabinet. The following table shows the Sunny Centrals are fitted with a transport lock for the transformers.

Sunny Central	Transformer transport lock
Sunny Central 200	yes
Sunny Central 250	yes
Sunny Central 250HE	no
Sunny Central 350	yes

1. Remove the transport lock bolts (A, B and C).



2. Remove the transport locks.

☑ The transport locks have been removed.

5 Internal Electrical Connections

Circuit diagram and equipment identifier

The exact position of the individual connection points can be determined with the help of the equipment identifier and the provided circuit diagram. In the front part of the circuit diagram, you will find an overview with data on the cable number and the respective connection point.

Electrical connections

For all electrical connections it is imperative that you comply with the supplied circuit diagram.

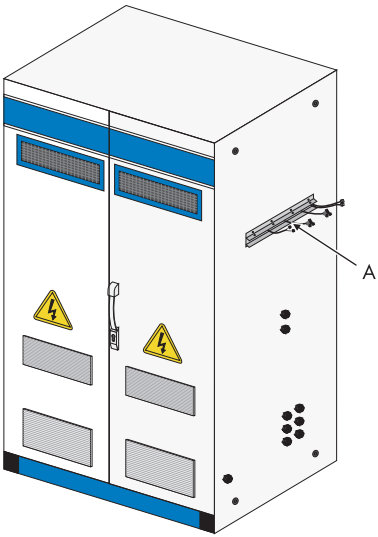
The following steps must be taken to make the internal electrical connection:

- Connect the power cables
- Connect the PE connection
- Connect the control cables to the power unit
- Connect the Sunny Central Control to the power unit
- Connect the internal control cables
- Connect the insulation monitoring (optional)
- Fit the internal temperature sensor
- Connect the team cable (optional)
- Connect the EVR resistor (optional)

5.1 Preparatory Work for the Sunny Central 200 / 250 with the "Protection against Chemically Active Substances" Option

The Sunny Central 200 / 250 units with the "Protection against chemically active substances" option have an encapsulated design. The two switch cabinet units are separated by a side wall. There are two sliding plates with a clamping felt in the side wall. The data and control lines are routed through the sliding plates which connect the DC cabinet to the AC cabinet. The procedure is described below. The following figures show the Sunny Central 250 with the "Protection against chemically active substances" option as an example.

1. Open the knurled nuts on the sliding plates (A).



2. Move the sliding plates up or down.
3. Route the following wires through the clamping felt into the AC cabinet.
   - Control lines
     (see section 5.4 "Connecting the Control Lines on the Transfer Terminal Strip" (page 42)).
   - Data lines
     (see section 5.5 "Connecting the Sunny Central Control to the Power Unit" (page 43)).
   - Internal control lines X8 and X9
     (see section 5.6 "Connecting the Internal Control Lines" (page 44)).
   - Insulation monitoring cable (optional)
     (see section 5.7 "Connecting Insulation Monitoring (optional)" (page 45)).
   - Temperature sensor
     (see section 5.8 "Installing the Internal Temperature Sensor" (page 46)).

   ☑ The individual lines are routed through the clamping felt into the AC cabinet. They are required in the following steps.

Notice!

Air permeable cable ducts cause corrosion in the Sunny Central.

- Press the sliding plates together with sufficient force.
- Tighten the knurled nuts on the sliding plates.

4. Connect the control cables to the transfer terminal strip.

☑ The control cables are connected.

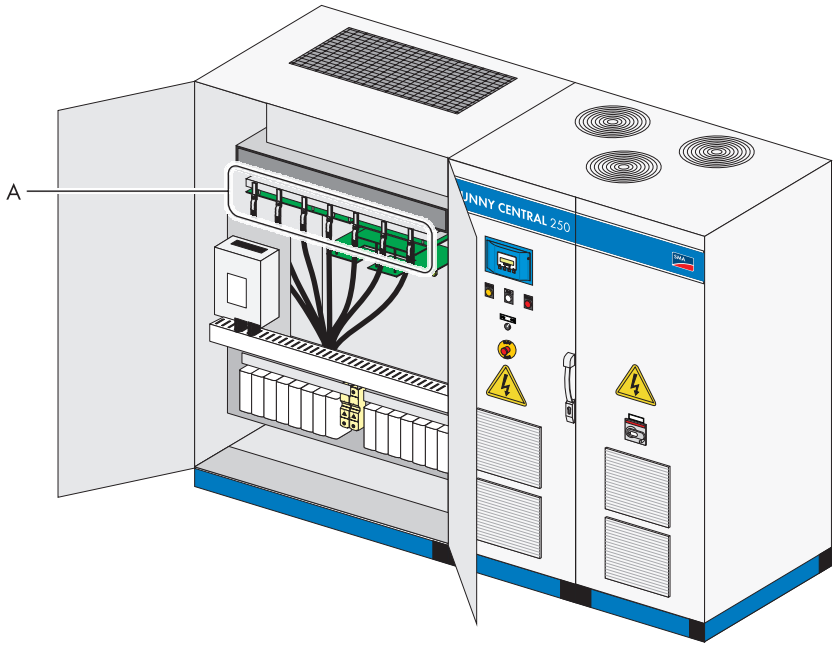
5.2 Connecting the Power Cables

5.2.1 Sunny Central 200 / 250 / 250HE

The power cables connect the power units in the DC / inverter cabinet with the sine wave filter in the AC cabinet.

The power cables (U1, V1, W1) are already connected to the sine wave filter and cut to length, so that the allocations on the power units are clear.

The following diagram shows the connection points of the power cables on the power unit of the Sunny Central 250.



A Power unit connection lugs

Procedure for power cabling:

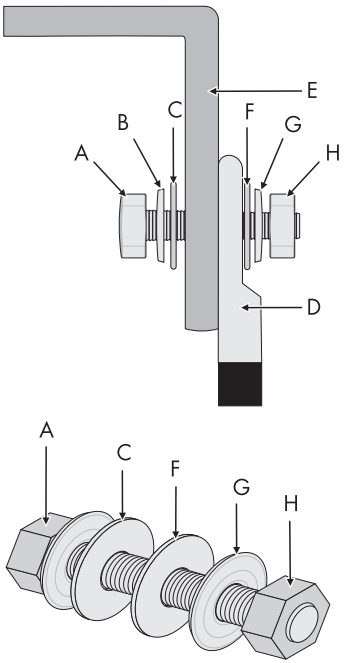
1. Unscrew the protective cover of the power unit.
   ☑ The protective cover has been removed. The connections on the power unit are now accessible.
2. Route the cables through the open side wall above the cabinet base plates into the DC- cabinet.
3. Use cable ties to bind the cables in the base of the switch cabinet.
4. Connect the left power unit first. Hold the bolts when tightening the nuts.

DANGER!
Danger of fire.

Incorrect connection of the power units can cause fires.

- Observe the sequence when connecting the power units.

A Bolt
B Locking washer
C Washer
D Power cable lugs
E Connection guide
F Washer
G Locking washer
H Nut



5. Bind the power cable with cable ties. If you do not do so, pointed or sharp metal edges could damage the insulation of the cable.

   ☑ Power cabling is complete.

6. Reattach the protective cover to the power unit.

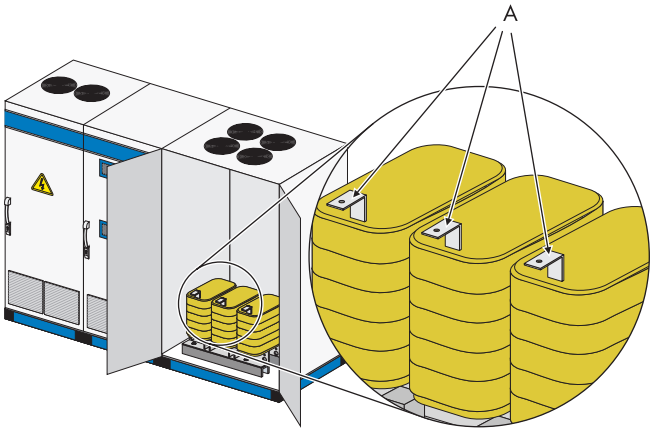
☑ The protective cover has been fitted.

5.2.2 Sunny Central 350

The power cables connect the sine wave filter in the DC- / inverter cabinet with the transformer in the AC cabinet.

The power cables (U1, V1, W1) are already connected to the sine wave filter and cut to length, so that the allocations on the transformer are clear.

The following diagram shows the connection points of the power cables on the transformer of the Sunny Central 350.



A Sine wave filter connection lugs

Procedure for power cabling:

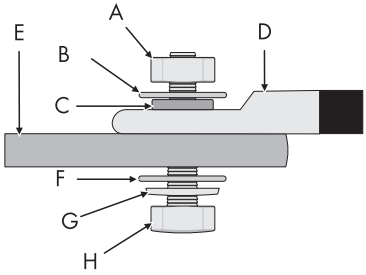
1. Route the cables through the open side wall above the cabinet base plates into the DC- cabinet.
2. Use cable ties to bind the cables in the base of the switch cabinet.
3. Connect the power cables. Hold the bolts when tightening the nuts.

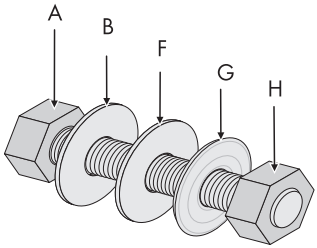
DANGER!
Danger of fire.

Incorrect connection of the power units can cause fires.

- Observe the sequence when connecting the power units.

A	Bolt
B	Washer
C	Measurement line cable lug
D	Power cable lug
E	Connection guide
F	Washer
G	Locking washer
H	Nut





4. Bind the power cable with cable ties. If you do not do so, pointed or sharp metal edges could damage the insulation of the cable.

   ☑ Power cabling is complete.

5. Reattach the protective cover to the power unit.

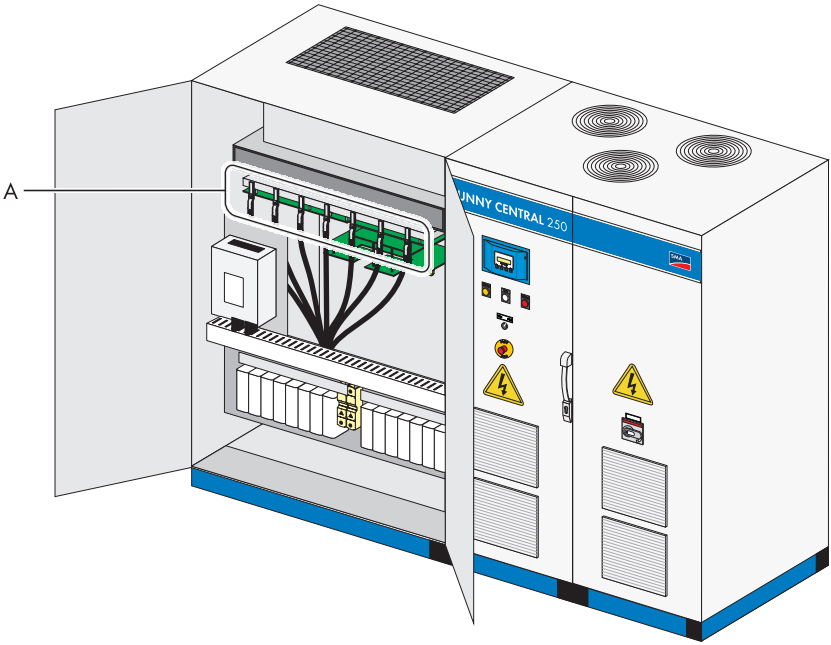
☑ The protective cover has been fitted.

5.2.3 Sunny Central 200 / 250 with the "Protection against chemically active substances" option

The power cables connect the power units in the DC / inverter cabinet with the sine wave filters in the AC cabinet. For the Sunny Central 200, 3 power cables must be connected and 6 are required for the Sunny Central 250.

The power cables (U1, V1, W1) are already connected to the sine wave filter and cut to length, so that the allocations on the power units are clear.

The following diagram shows the connection points of the power cables on the power unit of the Sunny Central 250.



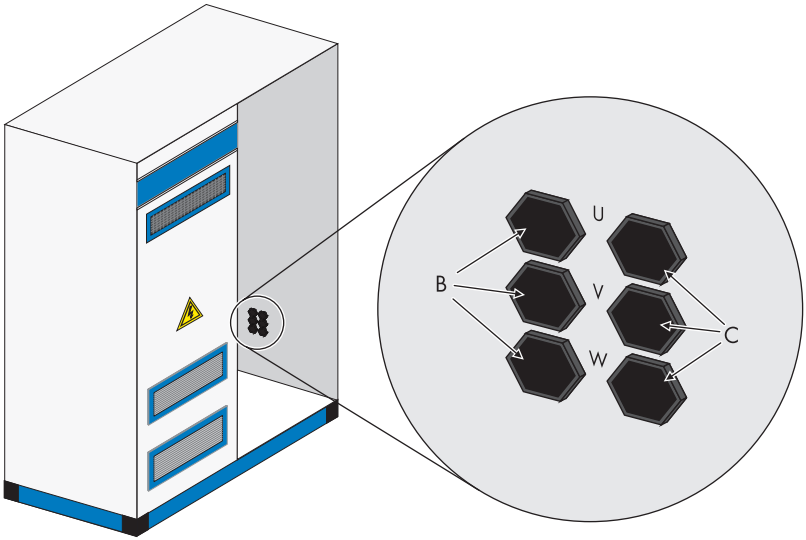
A Power unit connection lugs

Procedure for power cabling:

1. Unscrew the protective cover of the power unit.

   ☑ The protective cover has been removed. The connections on the power unit are now accessible.

2. Route cables 2W1, 2V1 and 2U1 through the cable gland (B) into the DC cabinet.



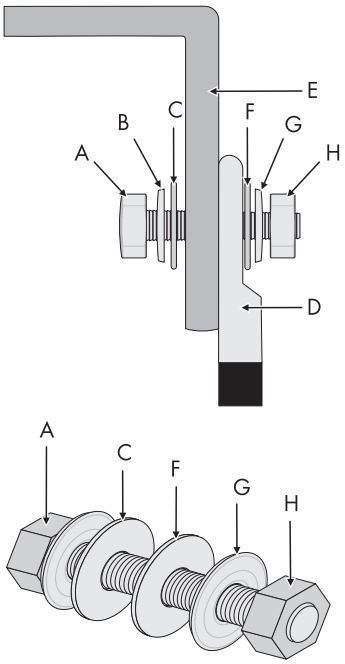
3. Connect cables 2W1, 2V1 and 2U1 to the left power unit.

DANGER!
Danger of fire.

Incorrect connection of the power units can cause fires.

- Observe the sequence when connecting the power units.

A Bolt
B Locking washer
C Washer
D Connection guide
E Power cable lug
F Washer
G Locking washer
H Nut



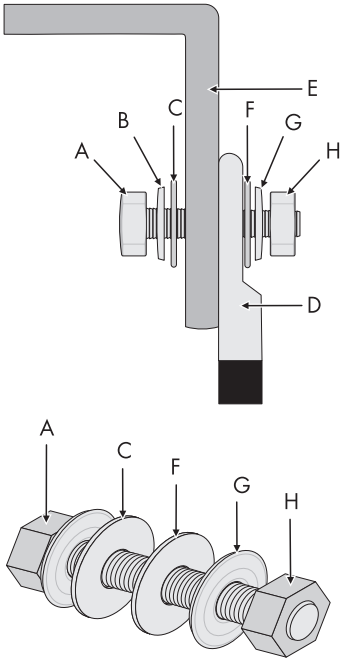
4. Route cables 2W2, 2V2 and 2U2 through the cable gland (C) into the DC cabinet.
5. Connect cables 2W2, 2V2 and 2U2 to the right power unit.

DANGER!
Danger of fire.

Incorrect connection of the power units can cause fires.

- Observe the sequence when connecting the power units.

A Bolt
B Locking washer
C Washer
D Connection guide
E Power cable lug
F Washer
G Locking washer
H Nut



6. Tighten cable glands B and C (see figure page 37).

Notice!
Air permeable cable glands cause corrosion in the Sunny Central.

- Tighten the cable gland sufficiently.

7. Bind the power cable with cable ties. If you do not do so, pointed or sharp metal edges could damage the insulation of the cable.

   ☑ Power cabling is complete.

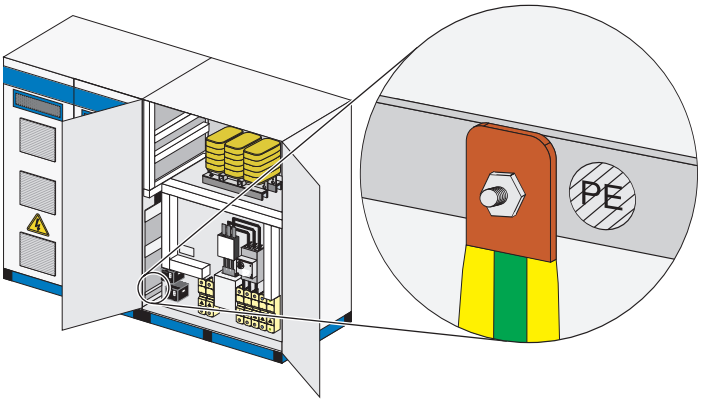
8. Reattach the protective cover to the power unit.

☑ The protective cover has been fitted.

5.3 Connecting the PE Connection

5.3.1 Sunny Central 200 / 250 / 250HE and 350

The PE rails of the two switch cabinets must be connected to one another. They are in the lower area of the side walls. The required cables are included. The following diagram shows the connection point of the PE connection of the Sunny Central 250 as an example.



Position of the PE rail

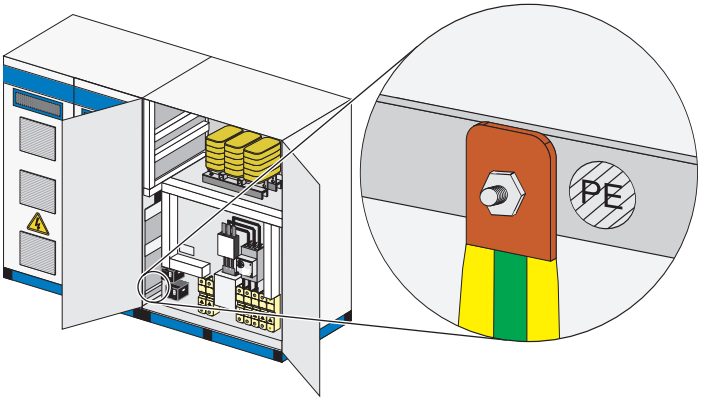
The exact position of the PE rail differs depending on the model. The exact position of the PE rail can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Connect the PE cables to the marked PE rails.
2. Ensure that the PE connection is correct and secure.

☑ The PE cable is connected.

5.3.2 Sunny Central 200 / 250 with the "Protection against chemically active substances" option

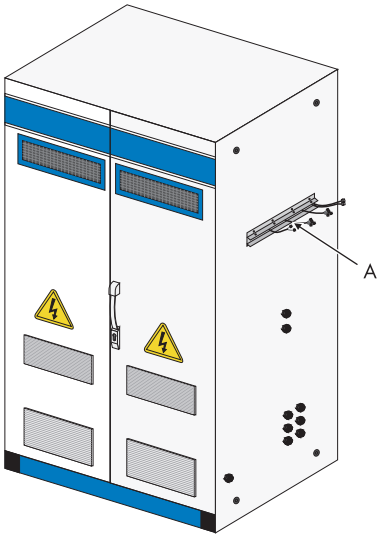
The PE rails for each cabinet are located in the lower region of the sides. The required cables are included. The following diagram shows the connection point of the PE connection of the Sunny Central 250.



Position of the PE rail

The exact position of the PE rail differs depending on the model. The exact position of the PE rail can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the PE cable through the cable gland (A).



2. Connect the PE cable to the marked grounding bar.
3. Tighten the cable gland (A).

Notice!

Air permeable cable glands cause corrosion in the Sunny Central.

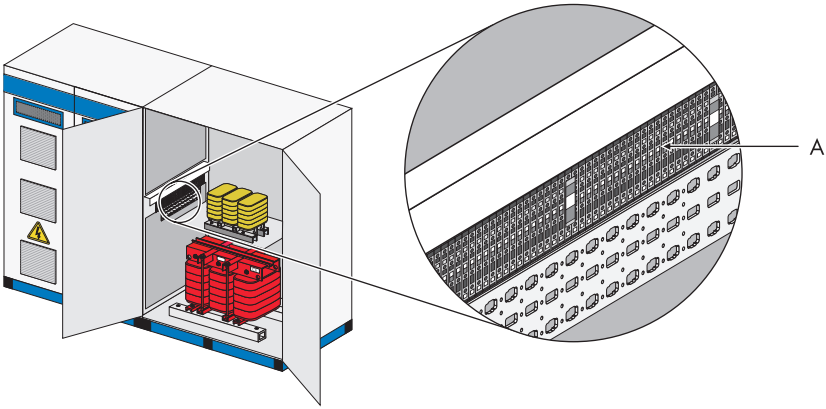
- Tighten the cable gland sufficiently.

4. Ensure that the PE connection is correct and secure.

☑ The PE cable is connected.

5.4 Connecting the Control Lines on the Transfer Terminal Strip

The control lines are located in the transfer cable duct of the inverter cabinet The control lines are marked with target designations. The following diagram shows the exact position of the transfer terminal strip of the Sunny Central 250.



A Transfer terminal strip

Position of the transfer terminal strip

The exact position of the transfer terminal strip differs depending on the model. The exact position of the individual terminals can be determined with the help of the equipment identifier and the circuit diagram enclosed.

Allocation of the control lines

The terminal designation is used for unique allocation of the control lines

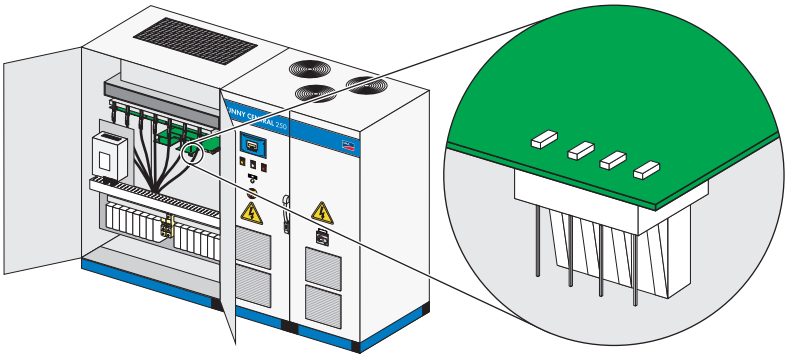
1. Connect the control lines on the transfer terminal strip.

☑ The control lines are connected.

5.5 Connecting the Sunny Central Control to the Power Unit

The data lines connect the Sunny Central Control to the controller board at the power unit. The data line is fitted with a 4-pin plug-in contact.

The following diagram shows the plug-in contact on the controller board of the Sunny Central 250 as an example.



A Controller board plug-in contact

Laying data lines

In order to guarantee interference-free signal transfer on the data line, it may not be laid parallel to the power cables or in the cable duct. Instead, lay the data line freely in the switch cabinet.

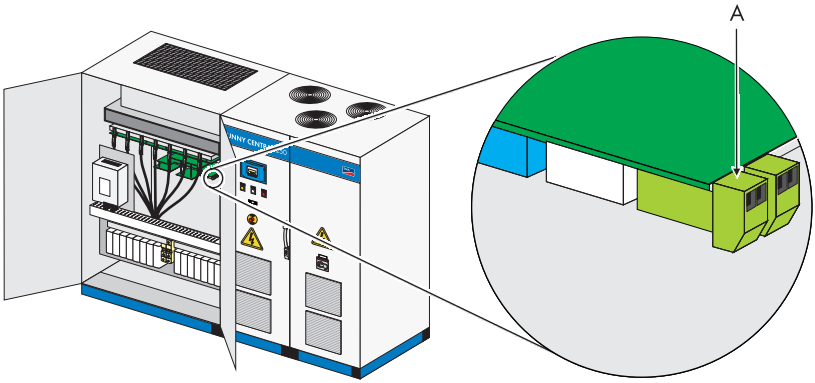
1. Connect the data line of the Sunny Central Control to the controller board at the power unit.

☑ The data line is connected.

5.6 Connecting the Internal Control Lines

The internal control lines X8 and X9 are located in the transfer cable duct of the inverter cabinet. They connect the AC cabinet to the controller board. The controller board is located on the power unit.

The following diagram shows the plug-in contact on the controller board of the Sunny Central 250 as an example.



A Plug-in contact for internal control lines X8 and X9

Position of the connection terminals of the control lines

The exact position of the plug-in contact differs depending on the model. The exact position of the connection terminals can be determined with the help of the equipment identifier and the circuit diagram enclosed.

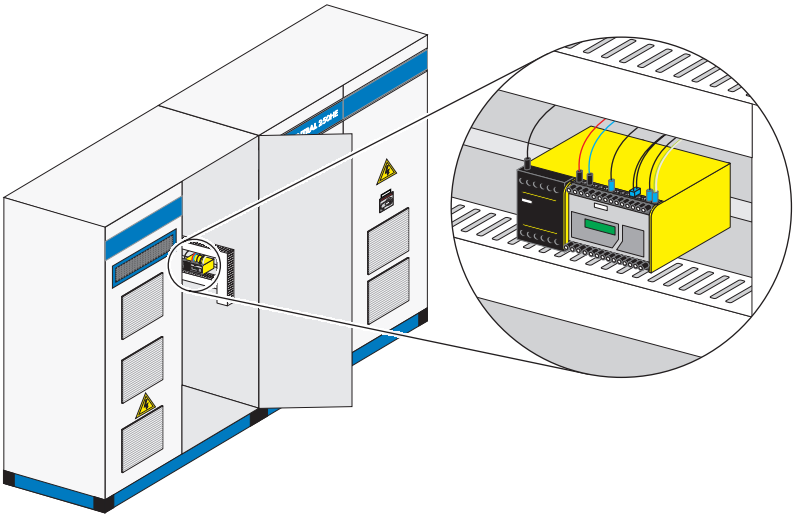
1. Connect control lines X8 and X9 to the controller board.

☑ The control lines are connected.

5.7 Connecting Insulation Monitoring (optional)

The 2-core connection line of the insulation monitoring system is located in the transfer duct. It connects the DC cabinet to the insulation monitoring system. The insulation monitoring system is located in the DC cabinet.

The following diagram shows the position of the insulation monitoring system in the Sunny Central 250 as an example.



Position of the insulation monitoring system

The exact position of the insulation monitoring system differs depending on the model. The exact position of the insulation monitoring system can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Connect the insulation monitoring system.

☑ The insulation monitoring system is connected.

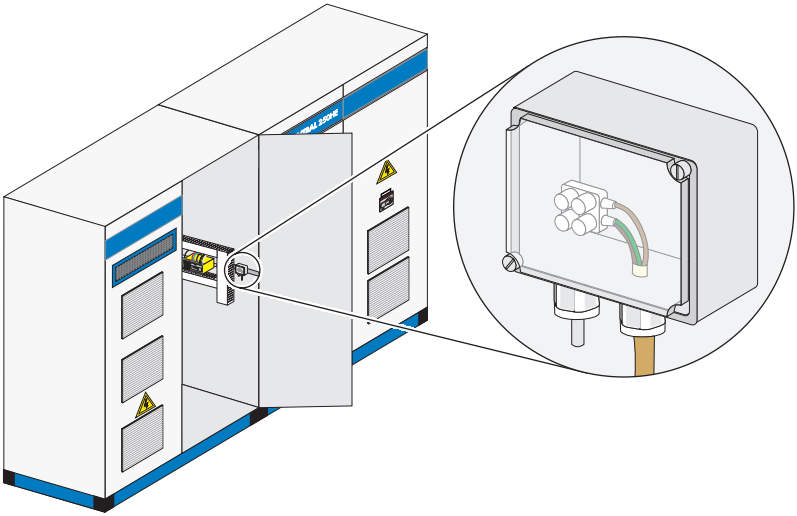
5.8 Installing the Internal Temperature Sensor

Temperature sensor in the Sunny Central 350

The temperature sensor in the Sunny Central 350 is pre-installed ex works. Continue with section 5.9 "Sunny Central in Team Connection (optional)" (page 47).

The internal temperature sensor records the temperature in the switch cabinet. It is located in the transfer cable duct. The internal temperature sensor is fitted to the inside of the switch cabinet. A corresponding top hat rail is pre-mounted at the marked installation location.

The following diagram shows the position of the internal temperature sensor in the Sunny Central 250 as an example.



Position of the internal temperature sensor

The exact position of the internal temperature sensor differs depending on the model. The exact position of the internal temperature sensor can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Click the temperature sensors into place in the top hat rail.

☑ The temperature sensor is installed.

5.9 Sunny Central in Team Connection (optional)

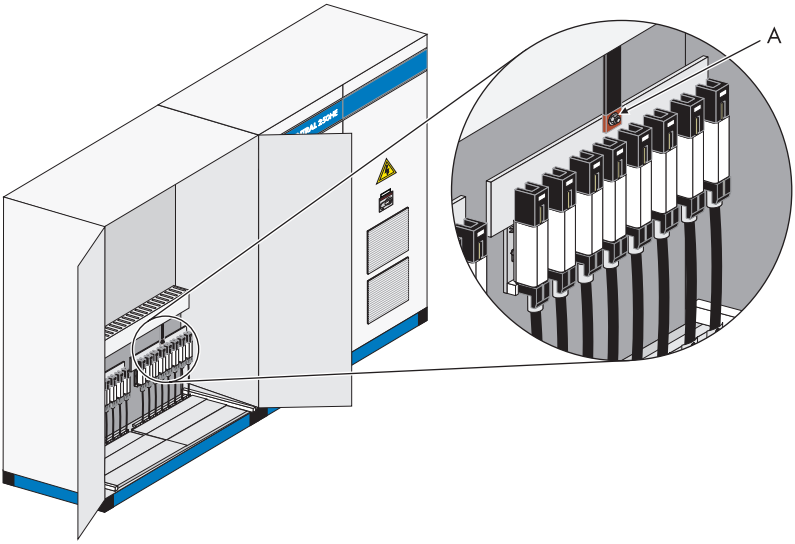
2 Sunny Centrals can also be connected to one another as an option. If team connection is used, the internal team cabling of both switch cabinet units must be connected.

5.9.1 Connecting the Team Cable to Sunny Central 200 / 250 / 250HE

Team cabling must be implemented for the team leader and the team device.

Team cabling is pre-installed in the AC cabinet. The team cables are in the AC cabinet. The connection terminals for team cabling are in the DC cabinet.

The following diagram shows the position of the connection terminals for team cabling in the Sunny Central 250.



A Team cable connection point

Position of the connection terminals for team cabling

The exact position of the connection terminals for team cabling can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Connect the team cable (L+) to L+ on the busbar.
2. Connect the team cable (L-) to L- on the busbar.

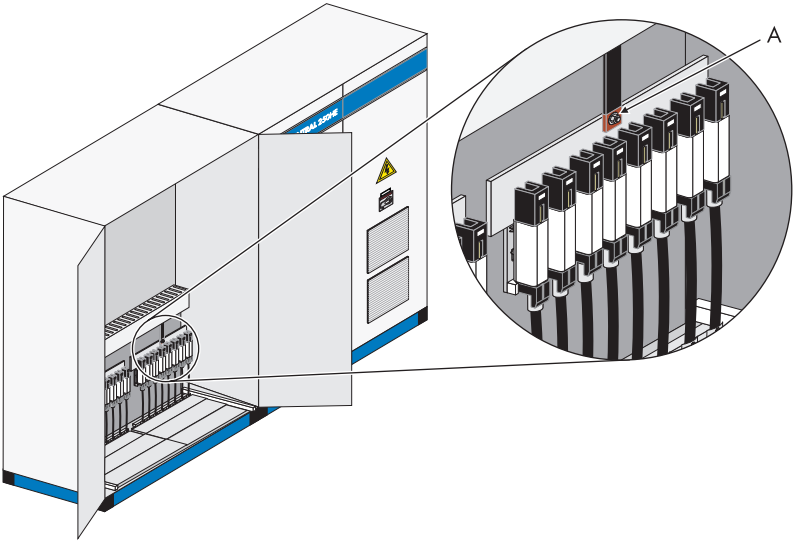
☑ The team cables are connected.

5.9.2 Connecting Team Cables for Sunny Central 200 / 250 with the "Protection against Chemically Active Substances" Option

Team cabling must be implemented for the team leader and the team device.

Team cabling is pre-installed in the AC cabinet. The team cables are in the AC cabinet. The connection terminals for team cabling are in the DC cabinet.

The following diagram shows the position of the connection terminals for team cabling in the Sunny Central 250.

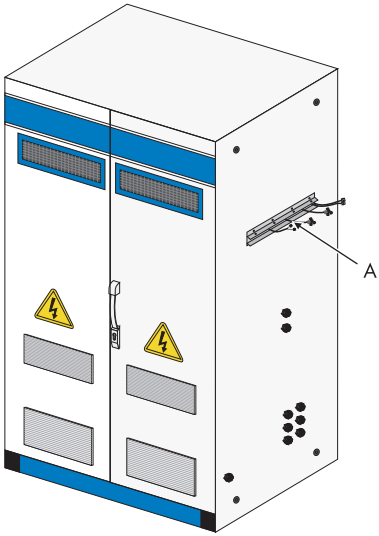


A Team cable connection point

Position of the connection terminals for team cabling

The exact position of the connection terminals for team cabling can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the team cables through the cable glands (A).



2. Tighten the cable gland (A).

Notice!

Air permeable cable ducts cause corrosion in the Sunny Central.

- Tighten the cable gland sufficiently.

3. Connect the team cable (L+) to L+ on the busbar.
4. Connect the team cable (L-) to L- on the busbar.

☑ The team cables are connected.

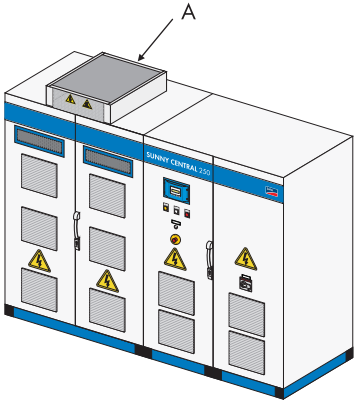
5.9.3 Team Cables for Sunny Central 350

Internal team cabling in the Sunny Central 350 is already completely connected when it leaves the plant.

5.10 Connecting the EVR Resistor (optional)

The EVR resistor increases the maximum permissible DC voltage which may be present at the device's connection when idle to 1000 V DC. The EVR resistor is mounted on the top of the Sunny Central If the EVR resistor is used, the exhaust air cannot be routed through the top of the Sunny Central. The exhaust air is routed through the rear wall.

The following diagram shows the position of the EVR resistor (A) using the Sunny Central 250 as an example.



Position of the connection terminals of the EVR resistor.

The exact position of the EVR resistor be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Slide the EVR resistor between the rails onto the top of the Sunny Central.
2. Remove the 9 bolts on the protective grille of the EVR resistor.
3. Remove the protective grille forwards.
4. Connect the PE cable in the EVR resistor to the bolt on the left side.
5. Secure the EVR resistor to the rails using the two bolts on the left and right in the EVR resistor.
6. Connect the power cables (included) as shown in the circuit diagram provided.
7. Secure the protective grille to the EVR resistor using the 9 bolts.

☑ The EVR resistor is connected.

6 External Connections

WARNING!

Risk of death due electric shock when live parts of the low-voltage grid are touched!

- Only work on the Sunny Central when it is switched off and voltage-free.
- All applicable safety requirements regarding the low-voltage grid must be observed.

WARNING!

Danger of fire in the event of direct contact of copper and aluminum.

If copper and aluminum come into contact, the contact surface between the cable lug and the connection guide can oxidize. This causes the contact point to heat up. In turn, this can cause a fire.

- Use a cupal washer or a copper-aluminum cable lug.

Connection Sizing

The installation conditions (separate document) contain the maximum connection cross sections of the lines and cable lugs. You can download the installation conditions in the Download area of www.SMA.de/en.

Electrical connections

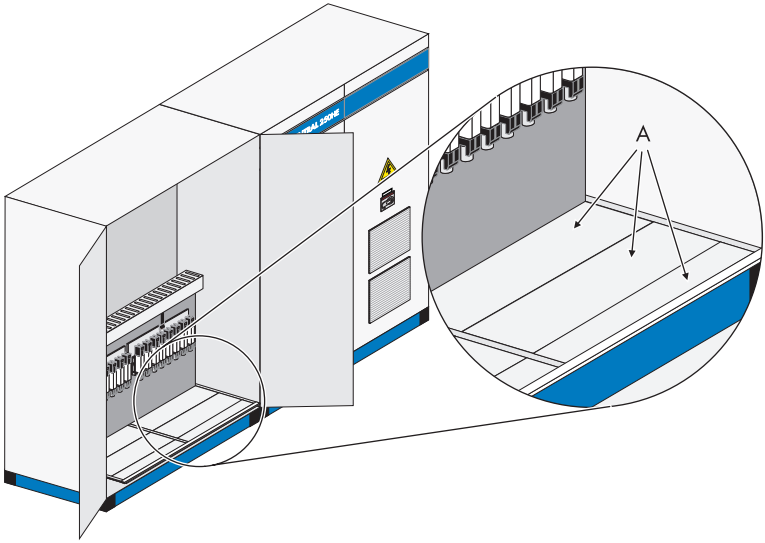
For all electrical connections, it is imperative that you use the supplied circuit diagram.

The following steps, explained in the next sections, are required for the external electrical connection.

- Connect the AC grid
- Connect the PE connection to the equipotential bonding (Sunny Central 250HE only)
- Connect the internal AC power supply
- Connect the DC cable
- Connect the team cable (optional)
- Connect the analog inputs
- Connect the communication
- Connect the emergency shut-off
- Connect the overvoltage protection

6.1 Removing the Sliding Plates

The external cables are fed in via the base of the Sunny Central. To do so, sliding plates in the base must be removed. The following diagram shows the position of the sliding plates in the DC- / inverter cabinet and in the AC cabinet.



1. Remove the sliding plates (A) in the front area of the DC- / inverter cabinet and the AC cabinet.
2. Keep the sliding plates in a safe place. After completing the installation work, the sliding plates must be reinstalled. (See section 6.11 "Fitting the Sliding Plates" (page 72)).

NOTICE!

Soiling in the Sunny Central adversely affects operation.

- If no work is performed on the Sunny Central (e.g. at night), re-insert the sliding plates to protect the Sunny Central against soiling.

6.2 Connecting the AC Grid

6.2.1 Connecting the AC Cable to the Sunny Central 200 / 250

Grid Structure

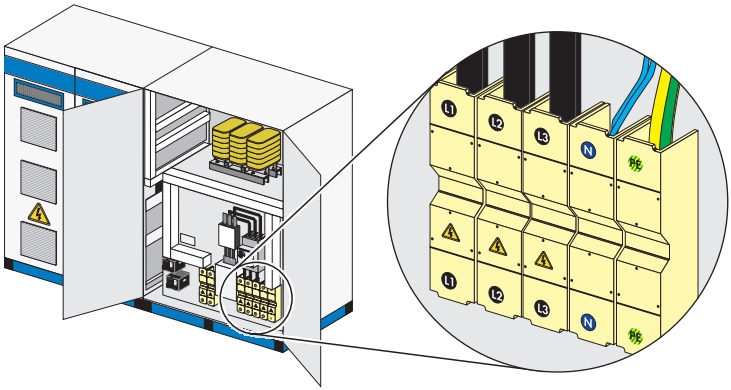
Sunny Centrals are configured for a TN-C grid connection. They can also be connected to TN-S or TT grids. To do so, remove the jumper between N and PE on the grid connection. An IT grid can be implemented specifically for each project. Contact the Sunny Central Service Line.

Fuse Links

The grid connection cable must be fused at the nominal current indicated on the type plate. If the specified nominal current differs from the nominal current of the fuse plug, use the fuse plug with the next highest nominal current.

The AC grid connection points are at the bottom left of the AC cabinet.

The following illustration shows the connection points for the AC grid in the Sunny Central 250 as an example.



Position of the AC grid connection points

The exact position of the AC grid connection points differs depending on the model. The exact position of the AC grid connection points can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the cable through the base opening into the AC cabinet.
2. Fit cable lugs to the cable.
3. Connect the cable.
4. Fit the strain relief of the AC grid connection lines. Use the enclosed cable clamps to secure the strain relief to the cable rail.

Observe the field of rotation.

The field of rotation at the grid connection points must be right. If the field of rotation is not right, the Sunny Central will output an error message.

☑ The AC cables are now connected.

6.2.2 Connecting the AC Cable to the Sunny Central 350

Grid Structure

Sunny Centrals are configured for a TN-C grid connection. They can also be connected to TN-S or TT grids. To do so, remove the jumper between N and PE on the grid connection.

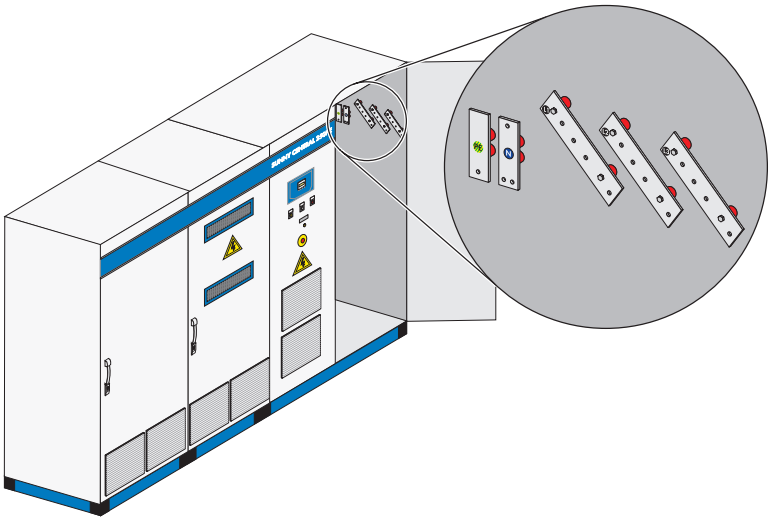
An IT grid can be implemented specifically for each project. Contact the Sunny Central Service Line.

Fuse Links

Fuse the grid connection cable at the nominal current indicated on the type plate. If the specified nominal current differs from the nominal current of the fuse plug, use the fuse plug with the next highest nominal current.

The AC grid connection points are at the top of the AC cabinet.

The following illustration shows the connection points for the AC grid in the Sunny Central 350 as an example.



Position of the AC grid connection points

The exact position of the AC grid connection points differs depending on the model. The exact position of the AC grid connection points can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the cable through the cable glands in the top into the interior of the switch cabinet.
2. Fit cable lugs to the cable.
3. Connect the cable.
4. Tighten the cable gland.

Observe the field of rotation.

The field of rotation at the grid connection points must be right. If the field of rotation is not right, the Sunny Central will output an error message.

☑ The AC cables are now connected.

6.2.3 Connecting the AC Cable to the Sunny Central 250HE

The Sunny Central 250HE is designed for connection to a medium voltage transformer. The grid connection form of the Sunny Central is an IT grid. In an IT grid, only the housings of the equipment are grounded. An insulation fault between the external line and the ground grounds the external line and causes increased voltage in the intact external line. The AC connection is 3-phase. The nominal voltage (U) between the external lines is 270 V, the nominal voltage between the external line and the ground is (U_0)1000 V (depending on the current operating status of the Sunny Central).

DANGER!

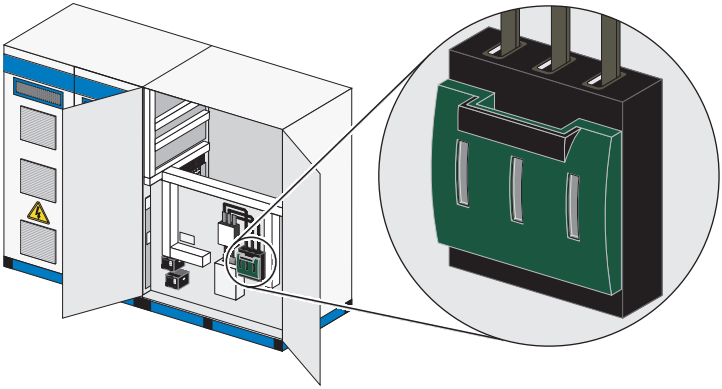
Danger of fire.

During operation, there are nominal voltages of up to 1000 V to the ground in an IT grid. If unsuitable AC cables are used, a fire could break out.

- Use only AC cables suitable for nominal voltages of up to 1000 V.
- Use only AC cables which are resistant to grounding and short circuits.

The connection to the fuse switch in the AC cabinet is 3-phase.

The following diagram shows the connection points for the AC grid of the Sunny Central 250HE as an example.



Position of the AC grid connection points

The exact position of the AC grid connection points differs depending on the model. The exact position of the AC grid connection points can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the cable through the base opening into the AC cabinet.
2. Fit cable lugs to the cable.
3. Connect the cable.
4. Fit the strain relief of the AC grid connection lines. Use the enclosed cable clamps to secure the strain relief to the cable rail.

Observe the field of rotation.

The field of rotation at the grid connection points must be right. If the field of rotation is not right, the Sunny Central outputs an error message.

☑ The AC cables are now connected.

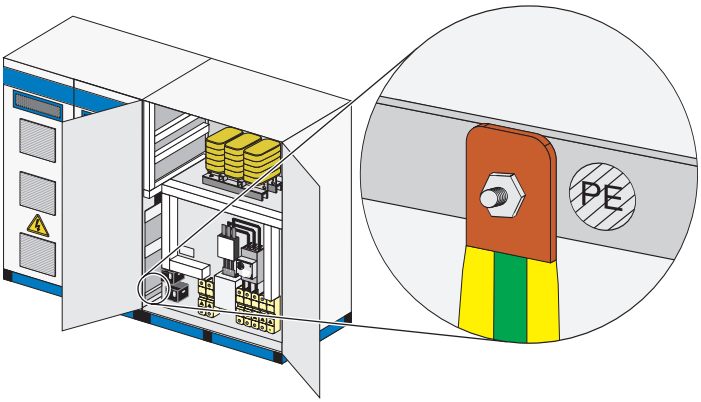
6.3 Connecting the External PE Connection (Sunny Central 250HE only)

The grid connection form of the Sunny Central is an IT grid. The PE rail in the AC cabinet must be incorporated in the equipotential bonding to ground the Sunny Central 250HE housing.

PE cable sizing

Use PE cables with a line cross section of at least 1 x 50 mm^2.

The following diagram shows the connection point of the external PE connection.



Position of the PE rail

The exact position of the PE rail can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the cable through the base opening into the AC cabinet.
2. Connect the PE cable in the AC cabinet.

☑ The PE cable is connected.

6.4 Connecting the Internal AC Power Supply

The power required to operate the Sunny Central 200, Sunny Central 250 and Sunny Central 350 is either supplied via an external power supply or tapped internally. If the power is tapped internally, the energy yield decreases by the system's own power requirements (fan, heater) of the Sunny Central.

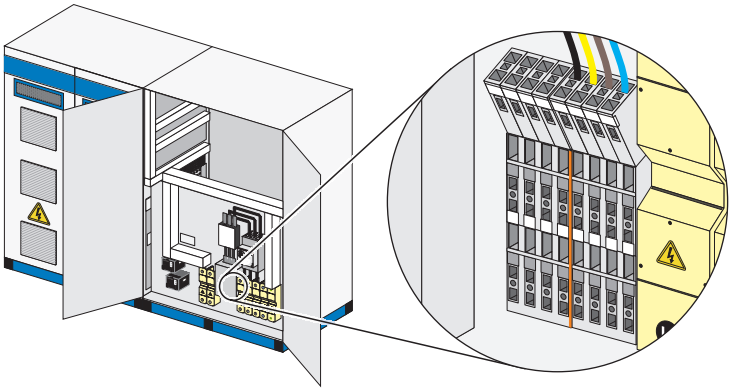
In the Sunny Central 250HE, an internal supply transformer can be connected in addition to the external power supply. For detailed information on connecting the internal supply transformer, see the Technical Information "Sunny Central - Important Information on Internal Supply Transformers). The standard grid connection structure for the internal power supply is a TN-S grid.

The Sunny Central 200 requires a single phase internal supply, the Sunny Central 250, Sunny Central 250HE and Sunny Central 350 require a three-phase internal supply.

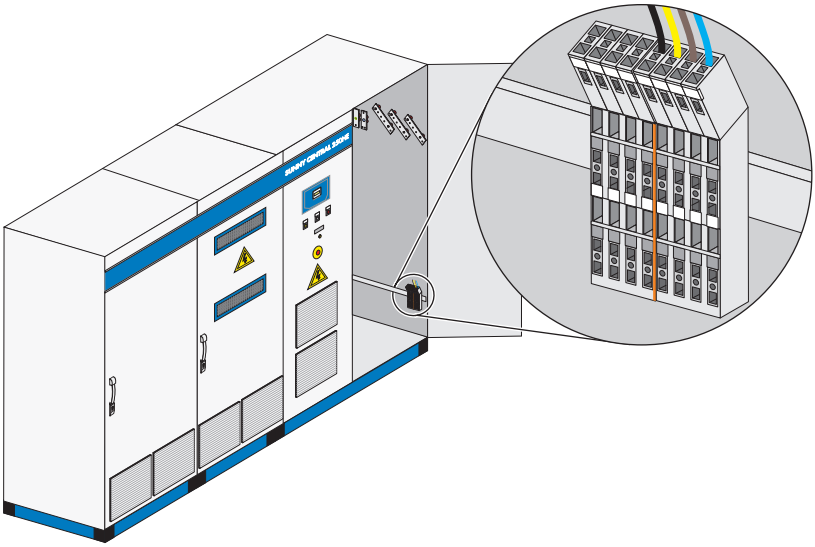
Circuit breaker for Internal Supply

Protect the grid connection line with a circuit breaker. See the Technical Data (see section 8 "Technical Data" (page 81)) for notes on dimensioning the line circuit breaker.

The following diagram shows the connection terminals for the internal AC power supply in the Sunny Central 250.



The following diagram shows the connection terminals for the internal AC power supply in the Sunny Central 350.



Position of the AC grid connection terminals

The exact position of the AC grid connection terminals differs depending on the model. The exact position of the AC grid connection terminals can be determined with the help of the equipment identifier and the circuit diagram enclosed.

6.4.1 Connecting the External Power Supply

1. Route the cable through the base opening into the AC cabinet.
2. Compress the AC grid connection terminals with a screwdriver.
3. Insert the cable into the terminal clamp.
4. Remove the screwdriver.

☑ The internal AC power supply is connected.

6.4.2 Connecting the Internal Power Supply

1. Bridge the terminal clamps in accordance with the circuit diagram.
2. Compress the AC grid connection terminals with a screwdriver.
3. Insert the cable into the terminal clamp in accordance with the circuit diagram.
4. Remove the screwdriver.

☑ The internal AC power supply is connected.

6.5 Connecting the DC Cable

The DC- / inverter cabinet contains optional high and low voltage fuses. They allow the string distribution boxes (e.g. Sunny Main Box) to be connected. All Sunny Centrals are equipped with one busbar per potential as standard.

Protected inputs on the Sunny Central

The Sunny Central has protected inputs on the DC side. The number depends on the device type. The number of DC inputs in the various Sunny Centrals is specified in the Technical Data.

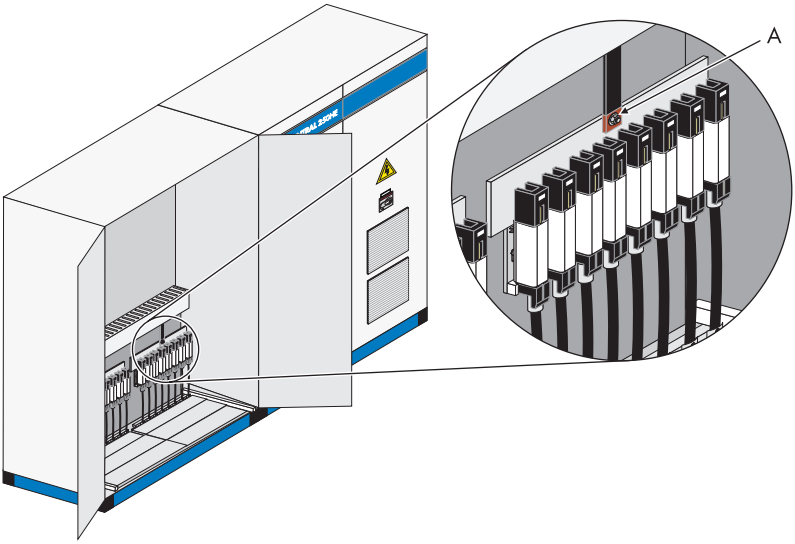
NOTICE!

Insufficient voltage resistance of the DC connection cable can cause short circuits which damage the Sunny Central.

- Use only DC cables which are sufficiently voltage-resistant.

6.5.1 Sunny Central 200 / 250 / 250HE

The following diagram shows the connections of the DC inputs in the Sunny Central 250 as an example.



A DC cable connection point

Position of the DC inputs

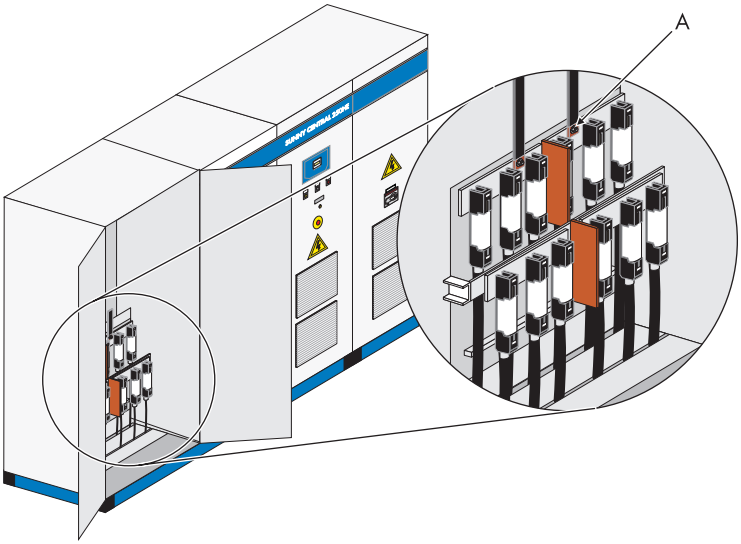
The exact position of the DC inputs differs depending on the model. The exact position of the DC inputs can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the cable through the base opening into the DC cabinet.
2. Fit cable lugs to the cable.
3. Connect the cable.
4. Fit the strain relief of the AC grid connection lines. Use the enclosed cable clamps to secure the strain relief to the cable rail.

☑ The DC cables are now connected.

6.5.2 Sunny Central 350

The following diagram shows the connections of the DC inputs in the Sunny Central 350 as an example.



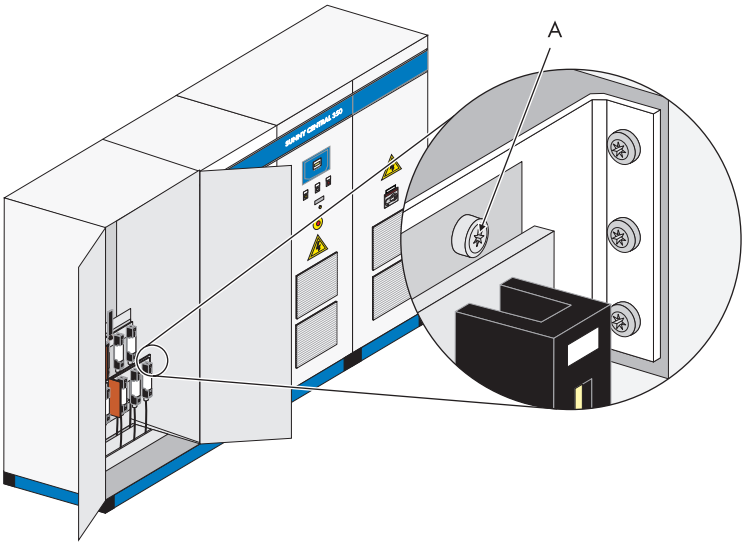
A DC cable connection point

Position of the DC inputs

The exact position of the PE rail differs depending on the model. The exact position of the DC inputs can be determined with the help of the equipment identifier and the circuit diagram enclosed.

The DC fuses are arranged in 2 rows. The cables are initially connected to the DC fuses of the rear mounting plate. The front DC cables cannot be connected to the fuses until the rear DC cables have been connected.

1. Remove the front mounting plate with the DC fuse units.



2. Route the cable through the base opening into the DC cabinet.
3. Fit cable lugs to the cable.
4. Connect the cables to the DC fuses of the rear mounting plate.
5. Fit the strain relief of the DC cables. The cable clamps required are included. Secure the cable clamps to the cable rail.
6. Reattach the front mounting plate.

   ☑ The cables are connected to the DC fuses of the rear mounting plate.
7. Route the cable through the opening into the DC cabinet.
8. Fit cable lugs to the cable.
9. Connect the cable to the DC fuses of the front mounting plate.
10. Fit the strain relief of the AC grid connection lines. Use the enclosed cable clamps to secure the strain relief to the cable rail.

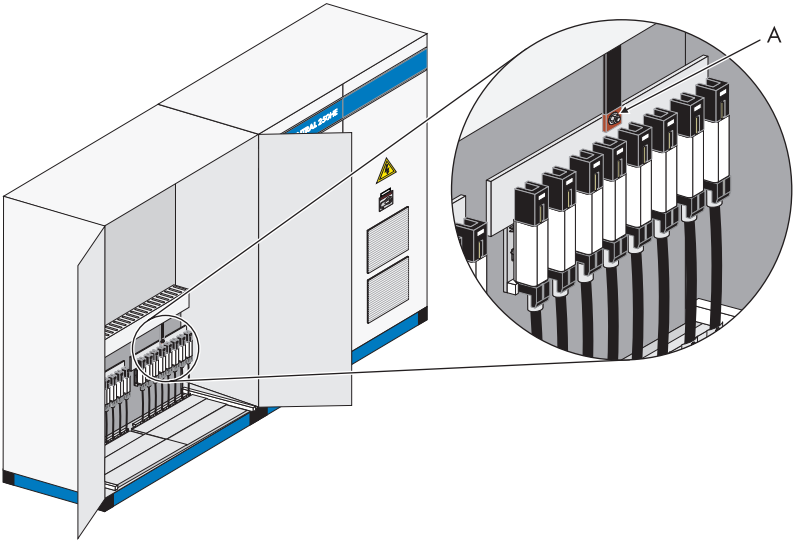
☑ The DC cables are now connected.

6.6 Connecting the Team Cable (optional)

The power cables in team connection connect the team leader to the team device. The cables required (standard length 5 m) are included. If the cable length is insufficient, another cable can be used. This cable must have a DC voltage resistance of 1000 V and be designed for the expected DC team current at a nominal output of 100 %. See the following table for the required information on DC team current.

Sunny Central	Maximum DC current input	Maximum DC team current
Sunny Central 200	472 A	236 A
Sunny Central 250	591 A	296 A
Sunny Central 350	800 A	400 A

The connection terminals for team connection are located in the cabinet. The following diagram shows the position of the connection terminals in the Sunny Central 250.



A Team cable connection point

Position of the connection terminals for the team connection.

The precise position of the connection terminals for the team connection differs depending on the model. The exact position of the connection terminals can be determined with the help of the equipment identifier and the circuit diagram enclosed.

1. Route the cable through the base opening into the DC cabinet.
2. Fit cable lugs to the cable.
3. Connect the cable.

4. Fit the strain relief. Use the enclosed cable clamps to secure the strain relief to the cable rail.

☑ The team cables are connected.

6.7 Analog Inputs

Connecting the Overvoltage Protection (optional)

The combined overvoltage and lightning protection for the signal inputs is available as an option.

Position of the overvoltage protection.

The exact position of the overvoltage protection can be determined with the help of the equipment identifier and the circuit diagram enclosed.

6.7.1 Analog Sensors

The Sunny Central allows a PT 100 temperature sensor and two additional sensors (pre-configured as ExtSollrr and ExtGlolrr) on the Sunny Central Control panel via the customer's terminal strip. See the table below for the respective connection options available for the customer. These sensors can be configured by the customer.

Connecting the Sensors

The procedure for connecting the sensors to the terminal strip in the Sunny Central Control is described in the documentation included.

Configuring the Sensors

Please refer to the Sunny Central operating instructions for detailed information.

6.7.2 External Signals

Other than the analog sensors, three further signal transducers can be connected (preconfigured as ExtAlarm, ExtSolP and ExtSolQ). These signals have a direct effect on the operation of the Sunny Central.

The external alarm input (ExtAlarm) can be used to monitor the function of the medium voltage transformer, for example. Note that sensors often require a 24 V_{DC} power supply. It can be tapped internally in the Sunny Central, or provided by an external source of power. The circuit diagram provided must be followed when connecting external signal transducers.

The other analog inputs (ExtSolP, ExtSolQ) help to regulate the effective and reactive power of the Sunny Central. These sensors are also connected to the customer's terminal strip.

6.7.3 Overview of the Analog Inputs

Assignment of the analog inputs on the Sunny Central Control

When connecting the analog inputs and for the digital signals, it is obligatory to follow the included circuit diagram.

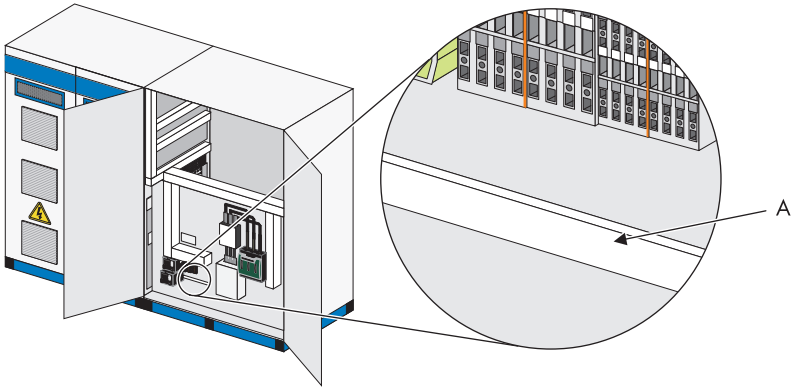
The connection is made at the connection terminals. Here, the connections for four-conductor and two-conductor sensors should be noted and any required measuring converters should be made available.

Analog Inputs	Ain	Name	Meaning
Customer	Ain 1	ExtSolP	External default nominal value for active power
Customer	Ain 3	ExtSollrr	External radiation sensor
Customer	Ain 4	ExtGlolrr	Pyranometer (measurement of global solar irradiation)
Customer	Ain 5	ExtAlarm	External alarm input, e.g. for monitoring the functioning of the medium-voltage transformer
Customer	Ain 6	ExtSolQ	External default nominal value for reactive power
Customer	Ain 8	TmpExt C	External temperature sensor / PT 100

6.7.4 Handling Notes for Shielded Contacts

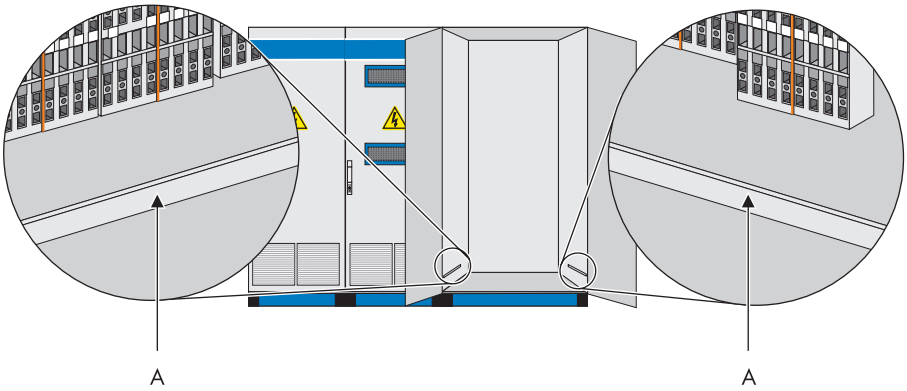
Always use a shielded product for external signal and bus lines. Contact the shield on the shield rail with the shield clamps over a large area. Use the shield clamps provided for the connection.

The connection terminals of the signal and bus lines are in the AC cabinet. The following diagram shows the position of the connection terminals in the Sunny Central 250.



A Connection point for shielded contact rail

The following diagram shows the position of the connection terminals in the Sunny Central 350.



A Connection point for shielded contact rail

Position of the connection terminals for signal and bus lines.

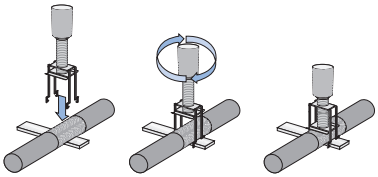
The exact position of the connection terminals for signal and bus lines can be determined with the help of the equipment identifier and the circuit diagram enclosed.

NOTICE!

Damage to the shield clamps.

- Only tighten the shield clamps hand-tight.
- Tightening the shield clamps using a screwdriver can damage the insulation.

1. Remove the line insulation.
2. Attach the shield clamp.
   ☑ The shield clamp snaps into place.
3. Tighten the shield clamps hand-tight. Tightening using a screwdriver is not necessary.



6.8 Remote Deactivation Unit

In addition to the key switch, another deactivation device can be implemented It is installed on the terminals in the Sunny Central. For this purpose, a 230 V power supply must be connected with the internal terminal.

Remote deactivation unit

For special project-specific requirements, the Sunny Central can be fitted with a remote deactivation unit combined with monitoring of the activation condition. This switching option allows the Sunny Central to be controlled from a control center without activating the key switch on the Sunny Central.

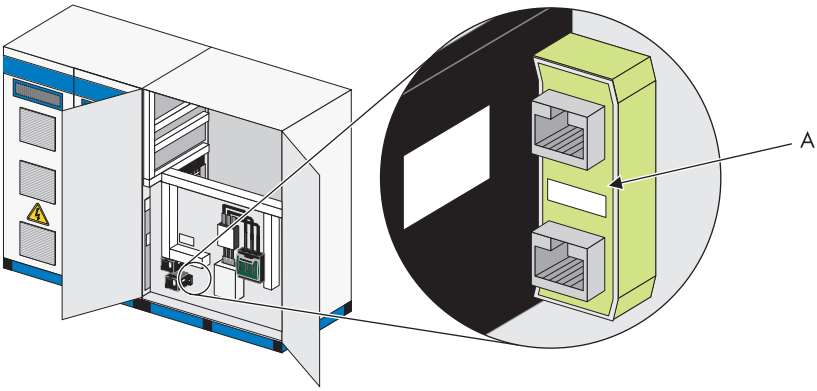
When connecting the remote deactivation unit, the circuit diagram included must be observed.

6.9 Connecting the Communication

6.9.1 NET Interface

The NET interface is used for communication with the Sunny Data Control, PC, modem or Sunny WebBox. The NET interface is option-dependent. An Ethernet, ISDN or analog interface can be implemented.

The NET interface is located in the AC cabinet. The following diagram shows the position of the NET interface (A) in the Sunny Central 250.



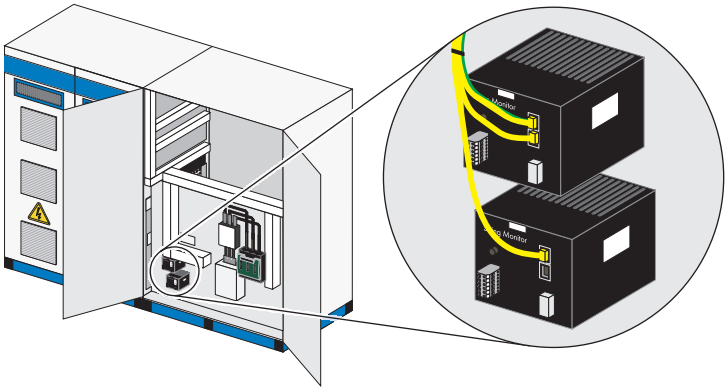
Position of the NET interface

The exact position of the NET interface can be determined with the help of the equipment identifier and the circuit diagram enclosed.

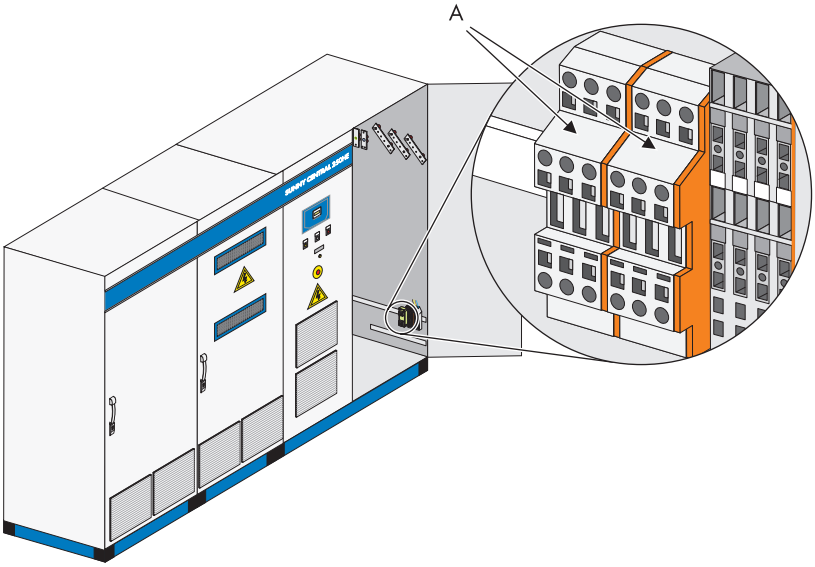
6.9.2 RS485 data line for communication with Sunny String-Monitors

Communication between the Sunny Central Control and the optional Sunny String-Monitors (DC distributor with integrated string current monitoring) is implemented via an RS485 data line, using the COM1 port of the Sunny Central Control. The RS485 data line of the string current monitoring of the Sunny Central String monitor is connected to the HUB assembly in the Sunny Central.

The hub is located in the AC cabinet. The following diagram shows the position of the hub in the Sunny Central 250HE.



In the Sunny Central 350, the HUBs are guided on terminals (A). The following diagram shows the position of the connection terminals in the Sunny Central 350.



Position of the HUB

The exact position of the HUB can be determined with the help of the equipment identifier and the circuit diagram enclosed.

Sunny String-Monitor Technical Description

For further information on the connection of the RS485 cabling, see the Sunny String-Monitor technical description.

6.9.3 Serial Interfaces for Team Connection

If team connection is used, communication connection is implemented via the COM1 port on both Sunny Central Controls. Termination then takes place in the Sunny Central Control. The Sunny Central Controls are preterminated at the factory.

1. Remove the jumper on the HUB (RS485 OUT).
2. Insert the CAT5 cable (CAT5 cable included).

Sunny String-Monitor Technical Description

The documentation provided with the Sunny Central String monitors contains a detailed description of the installation of the integrated string current monitoring.

6.10 Connecting the Emergency Shut-off

The Sunny Central is equipped with an internal emergency shut-off switch ex-works.

Position of the emergency shut-off terminals.

The exact position of the emergency shut-off terminals can be determined with the help of the equipment identifier and the circuit diagram enclosed. The connection must be made in accordance with the circuit diagram.

An external emergency shut-off function can be connected in the Sunny Central. The terminals for the external emergency shut-off are bridged ex-works. Remove the jumper if an external emergency shut-off is to be connected. Comply with the provided circuit diagram to connect the external emergency shut-off.

Emergency shut-off circuit

If several Sunny Centrals are operated in one system, they must all be switched off when one emergency shut-off switch is activated (creation of an emergency shut-off circuit). Connect all emergency shut-off switches in the emergency shut-off circuit in series.

WARNING!

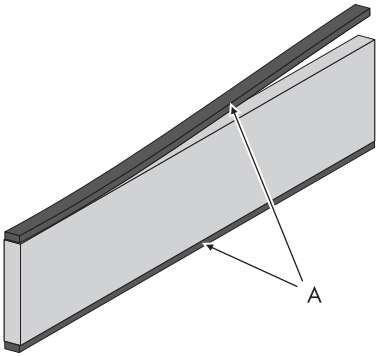
If emergency shut-off function fails, the protection function is impaired.

- In systems with more than one Sunny Central, the emergency shut-off circuits of the Sunny Centrals must be connected to one another.
- Only supply the emergency shut-off circuits of one Sunny Central with power.
- Test the function of the emergency shut-off circuits.

6.11 Fitting the Sliding Plates

After completing the installation work, the sliding plates must be reinstalled. This protect the Sunny Central against dirt and soiling.

1. Stick the provided sealing tape (A) to the front side of the sliding plates.



2. Seal the cable inlet (seal any free space with polyurethane foam).
3. Reattach the sliding plates in the front area of the DC- / inverter cabinet and AC cabinet.

☑ The sliding plates are now reattached.

7 Commissioning

Warranty or Guarantee Claims

Warranty or guarantee claims may only be asserted if initial commissioning has been performed by SMA Solar Technology or if the provided Commissioning Report for Sunny Central Systems has previously been completed, signed and returned to SMA Solar Technology.

Test and rectify any faults.

Rectify wiring faults based on the existing documentation and the circuit diagram.

The commissioning report supports you in the commissioning procedure.

1. Before initial commissioning, check the work carefully.
2. Check voltages and polarity on both DC- and AC sides. The voltages and polarity may not exceed the limit values permitted by the inverter.

The main tests for commissioning are described below.

Necessary Tests

The following conditions must be fulfilled before commissioning:

- All electrical connections made on-site must be checked for correct connection and secure attachment.
- The entire electrical system, including the photovoltaic generator, must be tested by the system installer in accordance with DIN VDE 0100-600 "Installing Low-Voltage Systems - Part 6: Tests". A test report of the tests made in accordance with DIN VDE 0100-600 must be completed. Additional tests are required for medium voltage systems if applicable. The grounding resistance of the system must be measured as part of this test. The grounding resistance is a key to the safety of the system.
- The voltages on the Sunny Central must be tested.

Switching elements

When delivered, all switching elements, e.g. circuit beakers and motor overload switches in the Sunny Central are switched off.

7.1 Checking the Sunny Central Cabling

All electrical connections made on-site must be checked for correct connection and secure attachment.

Checking Connections

See the documentation provided and the circuit diagram for the precise electrical connections.

In particular, not the following points:

- Misconnections.
- Incorrect polarity, in particular for power connections.

Make sure that everything is securely in place.

- Check that the connections have been tightened. Where possible, avoid retightening in accordance with the torque specifications in the circuit diagram.
- Only tighten loose connections in accordance with the torque specification in the circuit diagram.

Checking Internal Connections

- Check that the plugs of the transfer terminal strip are in the correct sequence and are securely in place.
- Check that the transformer or sine wave filter connections are securely in place and have the correct phase sequence.
- Check that the data and control lines on the power unit are correctly connected.
- Check that the data line for insulation monitoring is correctly connected.
- Check the installation location of the internal temperature sensor.
- Check the internal power cabling of the team connection (optional).
- Check the connection between the PE rails of the partial barrier.

Checking the AC Grid Connection

- Check the connections to ensure that they are securely in place.
- Check the phase sequence.
- Check the correct connection in accordance with the circuit diagram.
- Check the PE-N bridge for the grid structure TN-C or TN-S on-site and remove it if necessary.
- Check the correct installation of the covers. Correct installation means that contact protection is guaranteed.

Equipotential Bonding

- Sunny Central 250HE only: Ensure that the Sunny Central 250HE is connected to the equipotential bonding of the installation site.
- Check that the connections are secure.

Checking the Internal AC Power Supply

- Check the connections to ensure that they are securely in place.
- If power is supplied internally from the grid feed line, check that the jumper required is correctly positioned in accordance with the circuit diagram.
- If a separate external power supply from the power grid is used, check that the connection line is securely in place.
  - Remove the jumpers where applicable.
- Check that the connection is correct in accordance with the circuit diagram.
- Check that contact protection is guaranteed.

Checking the DC Cabling

- Check that the connection is securely in place.
- Check the polarity of the DC cables.
- Check that the connection is correct in accordance with the circuit diagram.
- Check the correct installation of the covers. Correct installation means that contact protection is guaranteed.

Checking the Team Cabling (optional)

- Check that the connection is securely in place.
- Check that the connection is correct in accordance with the circuit diagram.
- Check the correct installation of the covers. Correct installation means that contact protection is guaranteed.

7.1.1 Checking the Connection of the Serial Interfaces

Checking the external communication and the string current monitoring.

- Check the cabling of the connection of the data lines to the Sunny String-Monitor HUB.
- Check the connection of the NET interface.
- Check that the connection is correct in accordance with the circuit diagram.

7.1.2 Checking the Emergency Shut-Off Cabling

- Check that the connection is securely in place.
- Check that the connection is correct in accordance with the circuit diagram.
- Check that the emergency shut-off circuit is only supplied with power by one Sunny Central.
- Check that contact protection is guaranteed.

7.1.3 Checking the Thermostat and Hygrostat Settings

The device contains adjustable thermostats for controlling the cabinet ventilators and the over-temperature shut-off system. The heating system is controlled by an adjustable hygrostat. All thermostats and hygrostats are pre-adjusted before delivery.

Checking the settings of the thermostats and the hygrostat

Compare the settings with the specifications in the circuit diagram. If they deviate, set the values specified in the circuit diagram.

System check

The system must be checked by the system installer.

7.2 Checking the Voltages on the Sunny Central

WARNING!

Danger of fire if the connection is faulty.

Procedure before the commissioning test:

- Switch the Sunny Central to "Stop".
- Ensure that the fuses are not inserted.
- Ensure that the internal main switch, circuit breaker and automatic fuse are not activated.
- Leave the service room before switching on the voltage.

Checking the AC Grid Voltage

- Measure and record AC voltages
  - L1-L2
  - L1-L3
  - L2-L3
  - L1-N
  - L2-N
  - L3-N

Check that the field of rotation is to the right.

Deviating grid voltage

If the grid voltage deviates greatly, adjust the transmission ratio of the medium-voltage transformer if applicable.

Checking the Internal AC Power Supply

- Measure and record AC voltages
  - L1-L2
  - L1-L3
  - L2-L3
  - L1-N
  - L2-N
  - L3-N

Checking DC Voltages

WARNING!

Danger of arcing if the measuring device is incorrectly connected.

- Ensure that the measuring device is connected correctly.
- Select the appropriate measuring range.

- Measure and record the DC voltage for every input.
- Check that the polarity of each input is correct.
- Check the correct polarity of the DC busbar in the Sunny Central.
- Measure the voltage for every input and every pole to ground.
  - If the value is stable, a short to ground is present.
- Measure and compare the voltages of the individual inputs. The voltages must be approximately equal.
- The voltage must not exceed the maximum DC voltage of the inverter.

NOTICE!

Damage to the Sunny Central via excessive DC voltages

The DC voltage of the photovoltaic generator must never exceed the maximum permissible inverter voltage.

- U_{PV} = 1000 V for Sunny Central standard / HE with the EVR option
- U_{PV} = 880 V for Sunny Central standard / HE

7.3 Preparation for Commissioning

Fault display on the Sunny Central Control

See the Sunny Central user manual for details on troubleshooting.

If you cannot rectify the fault, contact the SMA Serviceline.

Preparatory Work

1. Disconnect all voltages.
2. Ensure that no voltage is present in the system.
3. Set the device to "Stop".
4. Insert the fuses.
5. Fit the covers.
6. Activate the internal main switch.
7. Close the circuit breakers.
8. Activate the automatic fuses.
9. Close the doors.
10. Leave the service room before switching on the voltage.

Switch on the voltages.

1. Activate the internal AC power supply externally.
   ☑ The Sunny Central boots and displays "Grid fault".
2. Activate the AC grid voltage externally.
   ☑ "Grid fault" is acknowledged automatically after a short period.
   – Check the current values of the grid voltage on the display.

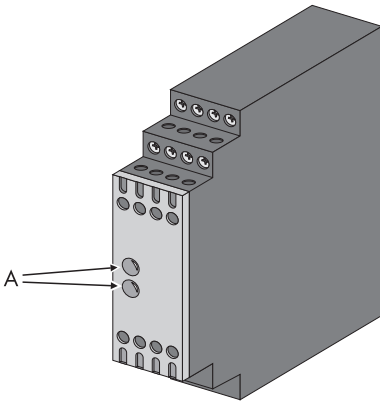
Checking the Emergency Shut-off

DANGER!

Death resulting from electric shock and burning upon touching the medium-voltage grid's live components.

- Do not touch parts other than those described in the instructions.

3. Open the switch cabinet doors of the AC cabinet.
4. Ensure that the emergency shut-off on the outside of the device is not activated.
5. Tape all door contact switches to the "On" position.
   ☑ During normal operation, both signal lights (A) of the emergency shut-off relay must illuminate.
6. If an emergency shut-off switch is now activated, the signal lights of the "Off" emergency shut-off relay must switch.
   ☑ The Sunny Central Control displays error message "206" and the fault must be acknowledged manually.



7. Unlock the emergency shut-off and acknowledge the fault on the Sunny Central Control. The fault is only displayed on the Sunny Central on which the emergency shut-off was activated.
8. Release door contact switches (remove the adhesive tape).
9. Close the cabinet doors.

Test for Emergency Shut-off Circuits.

If one emergency shut-off switch is activated, the emergency shut-off relay in all Sunny Centrals must be activated.

If an external emergency shut-off switch is activated, the Sunny Central does not indicate a fault.

10. Check the operation of each individual emergency shut-off switch. Test the switches on the cabinet, in the stations, and the other external emergency shut-off switches.

DC voltages

11. Switch on the external DC voltages.

Checking the Polarity of the Team Cables (optional

1. Open the door

WARNING!

Danger of arcing if the measuring device is incorrectly connected.

- Ensure that the measuring device is connected correctly.
- Select the appropriate measuring range.

2. Check that the polarity of connections to the team contactor established on-site is correct.
3. Close the door.

7.4 Switching On

The system may not be switched on until the following points are ensured:

- All tests and measurements have been performed.
- All values measured are within the permissible range.
- All switch cabinet doors must be closed.

☑ The inverter is now completely connected on the AC side and DC side.

Switching on the Sunny Central

1. Turn the key switch to the "Start" position.
2. Leave the service room.

☑ The Sunny Central will start automatically. First, the grid voltage and frequency parameters are checked. After approx. 20 seconds, the motorized DC switch is activated automatically and starts the photovoltaic generator.

After a wait period, the grid contactor is activated and the Sunny Central enters feed-in mode.

All device parameters are preset, even for options ordered. See the Sunny Central user manual for notes on system-optimized parameter settings. Turn the key switch to the "Stop" position to configure the Sunny Central.

Continue by commissioning the Sunny String-Monitors and external communication. The commissioning process for the Sunny String-Monitors is described in the Sunny String-Monitor installation guide.

8 Technical Data

8.1 Sunny Central 200

Input Specifications

Nominal power DC	P_{PV}	210 kW
Maximum PV power (recommended)	P_{PV}	230 kWp[a)]
DC voltage range (MPPT)	U_{DC}	450 V – 820 V[b)]
Maximum permissible DC voltage	U_{DC}	880 V
Maximum permissible DC voltage with EVR	$U_{DC\ EVR}$	1000 V (optional)
Maximum permissible DC current	I_{DC}	472 A
Voltage ripple, PV voltage	U_{PP}	< 3 %
Number of DC inputs / connection points		5 / DC fuses

a) Specifications apply for irradiation values = 1,000 (kWh / kWp x year)

b) U_{DCmin} at $U_{AC,Nom}$ +/– 5 % and cos φ = 1

Output Values

Nominal AC output power	P_{AC}	200 kW[a)]
Operating grid voltage +/– 10 %	U_{AC}	400 V
Nominal AC current	$I_{AC,Nom}$	289 A
Grid structure		TT, TN-S, TN-C
Operating range, grid frequency	f_{AC}	50 Hz - 60 Hz
Harmonic distortion of grid current		< 3 % at nominal power
Power factor	cos φ	> 0.98 % at nominal power

a) P_{nom} at $U_{AC,Nom}$ + 5 % and cos φ = 1

Efficiency

Max. efficiency $P_{AC,\ max}$	η	95.7 %
Euro-Eta	η_{euro}	94.5 %

Dimensions

Width / Height / Depth (W / H / D)[a)] (Standard)	800 mm + 1200 mm / 2120 mm / 850 mm
Width / Height / Depth (W / H / D)[b)] (for "Protection against chemically active substances" option)	1200 mm + 1200 mm / 2120 mm / 850 mm
Weight: approx.	1600 kg

a) The switch cabinet is raised by 210 mm for the EVR option.

b) The switch cabinet is raised by 210 mm for the EVR option.

Power Consumption

Own consumption in operation (P_{day})	< 1000 W
Standby operating consumption (P_{night})	< approx. 70 W
External power supply / grid structure	230 V, 50 Hz / 60 Hz / TN-S, TT
External pre-fuse for internal power supply	B 16 A, 1 pole

Sunny Central Control Interfaces

Communication (NET Piggy-Back, optional)	Analog, ISDN, Ethernet
Analog Inputs	1 x PT 100, 2 x A_{in} [a)]
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC interface (COM3)	RS232
Floating contact (external fault detector)	1

[a)] Terminal for an analog sensor provided by the customer in two-wire and four-wire version.

Standards

EMC	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes

Protection rating and ambient conditions

Protection rating as per EN 60529	IP 20
Permissible ambient temperatures	–20 °C ... +40 °C
Relative humidity, non-condensing	15 % ... 95 %
Maximum altitude above sea level	1000 m
Fresh air consumption	3300 m^3/h

8.2 Sunny Central 250

Input Specifications

Nominal power DC	P_{PV}	262 kW
Maximum PV power (recommended)	P_{PV}	290 kWp[a]
DC voltage range, (MPPT)	U_{DC}	450 V – 820 V[b]
Maximum permissible DC voltage	U_{DC}	880 V
Maximum permissible DC voltage with EVR	$U_{DC\ EVR}$	1000 V (optional)
Maximum permissible DC current	I_{DC}	591 A
Voltage ripple, PV voltage	U_{PP}	< 3 %
Number of DC inputs / connection points		8 / DC fuses

[a] Specifications apply for irradiation values = 1,000 (kWh / kWp x year)

[b] U_{DCmin} at $U_{AC,Nom}$ +/– 5 % and cos φ = 1

Output Specifications

Nominal AC output power	P_{AC}	250 kW[a]
Operating grid voltage +/– 10 %	U_{AC}	400 V
Nominal AC current	$I_{AC,Nom}$	361 A
Grid structure		TT, TN-S, TN-C
Operating range, grid frequency	f_{AC}	50 Hz - 60 Hz
Harmonic distortion of grid current		< 3 % at nominal power
Power factor	cos φ	> 0.98 % at nominal power

[a] P_{nom} at $U_{AC,Nom}$ + 5 % and cos φ = 1

Efficiency

Max. efficiency $P_{AC,\ max}$	η	96.1 %
Euro-Eta	η_{euro}	95.2 %

Dimensions

Width / Height / Depth (W / H / D)[a]	1200 mm + 1200 mm / 2120 mm / 850 mm
Weight: approx.	2070 kg

[a] The switch cabinet is raised by 210 mm for the EVR option.

Power Consumption

Own consumption in operation (P_{day})	< 1500 W
Standby operating consumption (P_{night})	< approx. 80 W
External power supply / grid structure	3 x 400 V, 50 Hz / 60 Hz / TN-S, TT
External pre-fuse for internal power supply	B 16 A, 3 pole

Sunny Central Control Interfaces

Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet
Analog Inputs	1 x PT 100, 2 x A_{in} [a)]
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC interface (COM3)	RS232
Floating contact (external fault detector)	1

[a)] Terminal for an analog sensor provided by the customer in two-wire and four-wire version.

Standards

EMC	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes

Protection rating and ambient conditions

Protection rating as per EN 60529	IP 20
Permissible ambient temperatures	–20 °C ... +40 °C
Relative humidity, non-condensing	15 % ... 95 %
Maximum altitude above sea level	1000 m
Fresh air consumption	4200 m^3/h

8.3 Sunny Central 250HE

Input Specifications

Nominal power DC	P_{PV}	261 kW
Maximum PV power (recommended)	P_{PV}	285 kW[a)]
DC voltage range, (MPPT)	U_{DC}	450 V – 820 V[b)]
Maximum permissible DC voltage	U_{DC}	880 V
Maximum permissible DC voltage with EVR	$U_{DC\ EVR}$	1000 V (optional)
Maximum permissible DC current	I_{DC}	591 A
Voltage ripple, PV voltage	U_{PP}	< 3 %
Number of DC inputs / connection points		8 / DC fuses

[a)] Specifications apply for irradiation values = 1,000 (kWh / kWp x year)

[b)] U_{DCmin} at $U_{AC,Nom}$ +/– 5 % and cos φ = 1

Output Specifications

Nominal AC output power	P_{AC}	250 kW[a)]
Operating grid voltage +/– 10 %	U_{AC}	270 V
Nominal AC current	$I_{AC,Nom}$	535 A
Grid structure		IT
Operating range, grid frequency	f_{AC}	50 Hz - 60 Hz
Harmonic distortion of grid current		< 3 % at nominal power
Power factor	cos φ	> 0.9 % at nominal power

[a)] P_{nom} at $U_{AC,Nom}$ + 5 % and cos φ = 1

Efficiency

Max. efficiency $P_{AC,\ max}$	η	97.5 %
Euro-Eta	η_{euro}	96.7 %

Dimensions

Width / Height / Depth (W / H / D)[a)]	1200 mm + 1200 mm / 2120 mm / 850 mm
Weight: approx.	1170 kg

[a)] The switch cabinet is raised by 210 mm for the EVR option.

Power Consumption

Own consumption in operation (P_{day})	< 1500 W
Standby operating consumption (P_{night})	< approx. 80 W
External power supply / grid structure	3 x 400 V, 50 Hz / 60 Hz / TN-S, TT
External pre-fuse for internal power supply	B 16 A, 3 pole

Sunny Central Control Interfaces

Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet
Analog Inputs	1 x PT 100, 2 x A_{in} [a)]
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC interface (COM3)	RS232
Floating contact (external fault detector)	1

[a)] Terminal for an analog sensor provided by the customer in two-wire and four-wire version.

Standards

EMC	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes

Protection rating and ambient conditions

Protection rating as per EN 60529	IP 20
Permissible ambient temperatures	–20 °C ... +40 °C
Relative humidity, non-condensing	15 % ... 95 %
Maximum altitude above sea level	1000 m
Fresh air consumption	3500 m^3/h

8.4 Sunny Central 350

Input Specifications

Nominal power DC	P_{PV}	369 kW
Maximum PV power (recommended)	P_{PV}	405 kWp[a]
DC voltage range, (MPPT)	U_{DC}	450 V – 820 V[b]
Maximum permissible DC voltage	U_{DC}	880 V
Maximum permissible DC voltage with EVR	$U_{DC\ EVR}$	1000 V (optional)
Maximum permissible DC current	I_{DC}	800 A
Voltage ripple, PV voltage	U_{PP}	< 3 %
Number of DC inputs / connection points		12 / DC fuses

[a] Specifications apply for irradiation values = 1,000 (kWh / kWp x year)

[b] U_{DCmin} at $U_{AC,Nom}$ +/– 5 % and cos φ = 1

Output Specifications

Nominal AC output power	P_{AC}	350 kW[a]
Operating grid voltage +/– 10 %	U_{AC}	400 V
Nominal AC current	$I_{AC,Nom}$	505 A
Grid structure		TT, TN-S, TN-C
Operating range, grid frequency	f_{AC}	50 Hz - 60 Hz
Harmonic distortion of grid current		< 3 % at nominal power
Power factor	cos φ	> 0.98 % at nominal power

[a] P_{nom} at $U_{AC,Nom}$ + 5 % and cos φ = 1

Efficiency

Max. efficiency $P_{AC,\ max}$	η	96.0 %
Euro-Eta	η_{euro}	95.2 %

Dimensions

Width / Height / Depth (W / H / D)[a]	1600 mm + 1200 mm / 2120 mm / 850 mm
Weight: approx.	2800 kg

[a] The switch cabinet is raised by 210 mm for the EVR option.

Power Consumption

Own consumption in operation (P_{day})	< 2500 W
Standby operating consumption (P_{night})	< approx. 70 W
External power supply / grid structure	3 x 400 V, 50 Hz / 60 Hz / TN-S, TT
External pre-fuse for internal power supply	B 16 A, 3 pole

Sunny Central Control Interfaces

Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet
Analog Inputs	1 x PT 100, 2 x A_{in} [a)]
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC interface (COM3)	RS232
Floating contact (external fault detector)	1

[a)] Terminal for an analog sensor provided by the customer in two-wire and four-wire version.

Standards

EMC	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes

Protection rating and ambient conditions

Protection rating as per EN 60529	IP 20
Permissible ambient temperatures	–20 °C ... +40 °C
Relative humidity, non-condensing	15 % ... 95 %
Maximum altitude above sea level	1000 m
Fresh air consumption	6500 m^3/h

9 Contact

If you have technical problems concerning our products, contact our Service Line. We require the following information in order to provide you with the necessary assistance:

- Sunny Boy device type
- Sunny Central serial number
- Type and number of modules connected
- Communication method
- Sunny Central failure or warning numbers
- Display message of the Sunny Central

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- Ignoring safety warnings and instructions contained in all documents relevant to the product
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